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FM 17-59

WAR DEPARTMENT

ARMORED FORCE FIELD MANUAL

DECONTAMINATION OF ARMORED FORCE VEHICLES

October 12, 1942

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ARMORED FORCE FIELD MANUAL

DECONTAMINATION OF ARMORED FORCE VEHICLES

CHANGES No. 1

WAR DEPARTMENT,
WASHINGTON, March 4, 1943.

FM 17–59, October 12, 1942, is changed as follows:

■ 12. FIRST ECHELON.—*a. Light tanks.*

* * * * *

(3) *Alternate methods.*—(*a*) * * *

1. Interior should be * * * fire or explosion. Until gasoline fumes in the interior are removed, flames must be avoided both inside and outside the tank, and weapons should not be fired except in case of emergency. The interior of the tank is never burned off.

* * * * *

b. Medium tanks.

* * * *

(4) *Alternate methods.*—(*a*) * * *

1. Interior should be * * * fire or explosion. Until gasoline fumes in the interior are removed, flames must be avoided both inside and outside the tank, and weapons should not be fired except in case of emergency. The interior of the tank is never burned off.

* * * *

e. (Added.) *Special precautions.*—(1) During training, decontamination of vehicles by burning off will be in the presence of a commissioned officer only. All members of the crew will dismount and vehicular fire-fighting equipment will be held ready outside the vehicle.

(2) Decontamination by burning off is forbidden during training except when all the provisions of this manual are carefully and fully complied with.

[A. G. 062.11 (2–4–43).] (C 1, Mar. 4, 1943.)

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SECTION IV (ADDED)

INDIVIDUAL PROTECTIVE COVER

■ 16. PURPOSE.—*a.* The cover, protective, individual, issued two per person, is carried in the gas mask carrier.

b. The cover is intended to protect against liquid vesicants sprayed from the air. It should prevent the contamination of clothing and reduce the requirements for decontamination.

■ 17. USE OF COVER.—*a.* The cover is large enough to permit the performance of most combat duties. In driving a vehicle, the cover may be placed over the steering wheel but should not be tucked in around the seat or body as this will cut off the air supply and quickly foul the air inclosed.

b. For drill purposes, extra covers should be used as they will become damaged in use and will become difficult to refold.

c. Before going into a theater of operations where vesicants are likely to be used the following should be done:

(1) Pull the rip tape and remove the end of the envelope of the cover intended for immediate use to permit it to be instantly withdrawn.

(2) Place the spare cover between the canister and canister straps.

(3) Place the cover intended for immediate use in the front part of the carrier.

d. Figures 55 to 58, inclusive, show how to don the cover. Figures 20 to 22, inclusive, show method of disposing of covers after a gas attack.

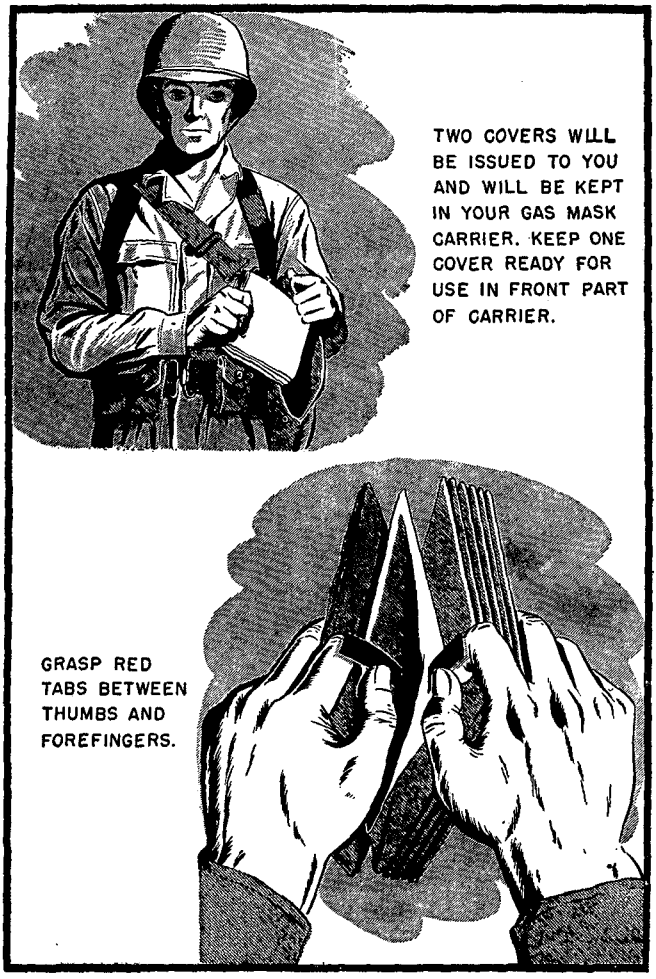


FIGURE 55.—Donning the protective cover.

FIGURE 56.—Donning the protective cover.

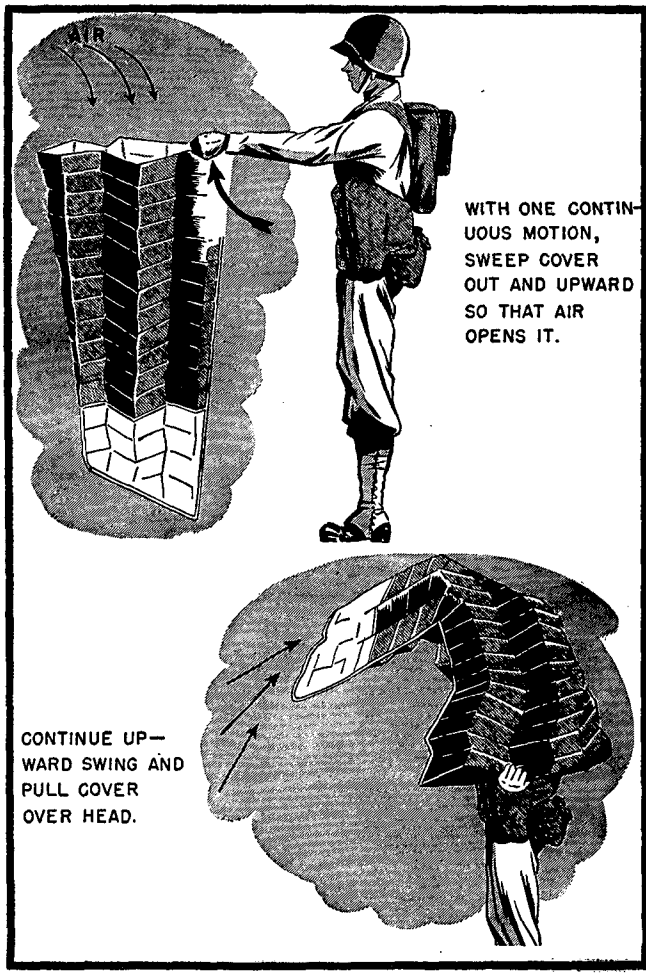
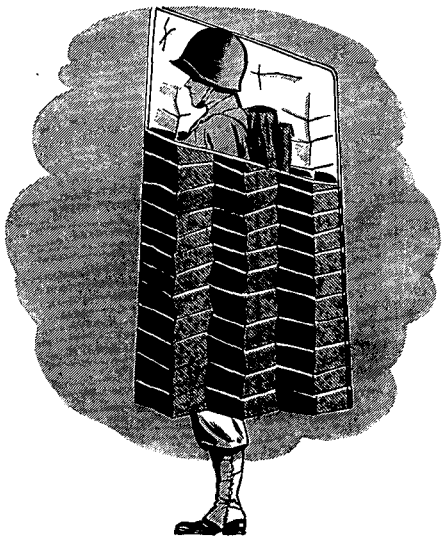


FIGURE 57.—Donning the protective cover.



PULL COVER DOWN, PROTECTING BODY
AND CLOTHING FROM AIRPLANE SPRAY.

FIGURE 58.—Donning the protective cover.

[A. G. 062.11 (2–4–43).] (C 1, Mar. 4, 1943.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

U. S. GOVERNMENT PRINTING OFFICE: 1943

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FM 17-59

ARMORED FORCE FIELD MANUAL

DECONTAMINATION OF ARMORED FORCE VEHICLES

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1942

WAR DEPARTMENT,
WASHINGTON, October 12, 1942.

FM 17–59, Armored Force Field Manual, Decontamination of Armored Force Vehicles, is published for the information and guidance of all concerned.

[A.G. 062.11 (9–15–42).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
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(For explanation of symbols see FM 21–6.)

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RESTRICTED

ARMORED FORCE FIELD MANUAL

DECONTAMINATION OF ARMORED FORCE VEHICLES

SECTION I

GENERAL

■ 1. GENERAL.—Gas attacks from the air and large-scale gas barriers are a serious threat to ground troops. The protection offered by armored vehicles and the ability of armored units to carry antigas equipment in vehicles which are immediately available to the personnel make it possible for the Armored Force to carry out its normal combat missions with minimum loss in efficiency and effectiveness. In order to attain this goal preventive measures must be taken before entry into operations and thorough training conducted in the technique prescribed in this manual.

■ 2. PURPOSE.—*Time, place,* and *degree* of decontamination to be carried out in a tactical situation is a command decision. The purpose of this manual is to prescribe preventive measures to be taken prior to active operations and the steps necessary to decontaminate vehicles under combat conditions. The procedures prescribed will neutralize the effects of persistent gas with the least interference with the mission of the unit and will prevent excessive casualties.

■ 3. SCOPE.—This manual describes the equipment and materials used in decontamination, and prescribes the measures to be taken before entry into active operations. It includes the procedure of decontamination in all echelons.

■ 4. CHARACTERISTICS OF PERSISTENT CHEMICAL AGENTS.—*a.* Persistent chemicals are heavy, oily liquids which adhere to the surfaces of vehicles for varying lengths of time. They are readily absorbed by oil paints, by untreated fabrics and leather, and by grease, but are only moderately absorbed by lacquers used on vehicles of the Armored Force. Rubber absorbs them slowly. If left on the vehicles, weapons, and equipment the liquids will burn the skin of the personnel who

come in contact with them and will give off vapors which will burn the eyes and lungs if the gas mask is not worn.

b. The gas mask offers complete protection for the eyes and lungs, but vapors will cause blisters when the skin is exposed to them for long periods. Protective clothing offers protection against vapor and small droplets of liquid, although large drops may penetrate it and burn the skin.

c. The effect of these chemicals may be neutralized by the action of decontaminating agents; they can be removed by heat, or dissolved in gasoline, Diesel fuel, kerosene, or engine oil and subsequently wiped off, and on bright or lacquered metal surfaces they can be removed by scouring with mud. These chemicals do not dissolve in water, but when nothing better is available, water, especially hot, soapy water, may be used to wash them off.

■ 5. TYPES OF CONTAMINATION.—Contamination of vehicles will occur in one of four ways:

a. From passing over contaminated terrain covered by undergrowth, high grass, mud or dust.—This will result in contaminating the under carriage of the vehicles by direct contact with the chemical in liquid form on the vegetation or by picking up the chemical in the mud or dust. Usually such contamination will not present a serious problem to the continued operation of the vehicle if the chemical is removed from the front of the vehicle so that the vapors are not carried into the crew compartment.

b. From airplane spray.—This type of contamination is especially serious in the case of open vehicles as the personnel and their equipment will probably be contaminated at the same time. The chemical will appear as small, dark-colored droplets varying in size from specks to large rain drops. The tank, if buttoned up, will largely protect the crew from liquid chemicals; however, the chemical must be removed from surfaces over which air passes on its way into the crew compartment, otherwise a dangerous vapor concentration of gas may be present in the air that passes through the crew compartment.

c. From the splash of a direct hit or near miss by gas shells and gas bombs.—Contamination of this type will be very heavy and may drive the liquid chemical through the crevices into a closed tank or into the body of an open vehicle. In

such instances the vehicle is generally smeared at least on one side with liquid chemical and should be decontaminated at the earliest possible opportunity consistent with the tactical situation.

d. From standing in an atmosphere with a heavy concentration of chemical in vapor form.—Such contamination is generally light and consists of the absorption of the vapor by grease and oil on the vehicle. It may also be absorbed by leather, rubber, and fabric equipment which may be in the vehicle if the equipment has not been previously treated.

■ 6. PREVENTIVE MEASURES.—*a.* In order for personnel to be able to protect themselves and to be in a constant state of readiness to perform first echelon decontamination without loss of valuable time, impregnated clothing, including cotton gloves, must be worn when in active operations, and cellophane covers must be carried, one of which has been removed from the container and is ready to be adjusted.

b. Persistent liquid chemicals can be removed from metal, lacquered metal surfaces, and gas-impervious fabric in a short time. However, those chemicals in both liquid and vapor form will enter into ordinary fabric and leather equipment, rendering it unsafe to handle. The time required to decontaminate such equipment is so great that it may seriously interfere with time and space factors in active operations, but if these decontaminating measures are not taken, casualties will be excessive and the vapors will force crews into gas masks for extended periods with attendant lowering of efficiency. On vehicles not equipped with gas-impervious fabric, the ordinary fabric and leather equipment can be treated prior to contact with gas to prevent its contamination so that undue delays or excessive casualties will be eliminated. It is the responsibility of Armored Force commanders to see that these measures are taken prior to entry into active operations. The following will be accomplished either when the unit is alerted at its home station for movement to a theater of operations, in the staging area, or immediately upon arrival in the theater of operations, according to where the materials are made available and the instructions issued in each case.

(1) Combat clothing, if not impregnated before it is is-

sued, will be impregnated by field methods (see TC No. 4, W. D., 1942, and FM 21–40).

(2) All ordinary fabric equipment normally carried on vehicles, such as top covers, seat covers, weapon covers, etc., will be impregnated by the same method except when made from gas-impervious materials.

(3) Large pieces of fabric and fabric equipment which is padded or cannot be removed from vehicles, such as canvas vehicle top covers, seat and back rests, etc., will be impregnated by applying the heated impregnite with a brush or broom.

(4) Leather equipment will be treated with shoe impregnite.

(5) Instructions will be given that in the theater of operations impregnated top covers for scout cars and personnel carriers when not over the vehicle will be used inside the vehicle to cover extra ammunition, rations, and personal equipment.

■ 7. METHODS OF DECONTAMINATION.—*a. Natural means.*—Persistent chemicals evaporate slowly and the time that they will remain on open surfaces is affected by temperature and wind. Some of the chemicals react with water and become harmless, especially when mixed with mud. Therefore, the weather elements and the scouring action and presence of mud tend to decontaminate the vehicle. It is quite possible that a tank might be heavily contaminated in the early morning and if run all day, particularly on a hot humid day over muddy terrain, might be sufficiently decontaminated by evening to be safe. On the other hand, if a more rapid means is not applied, the crew's efficiency will be reduced by the prolonged wearing of the gas mask, and in the case of open vehicles the personnel will probably be burned by contact with the liquid chemical. Therefore, manual means of decontamination should be used at the earliest opportunity consistent with the mission.

b. Manual means.—(1) *First echelon.*—First echelon decontamination is performed by the crew of the vehicle with the equipment normally carried in the vehicle. This is usually sufficient to keep the vehicle in action with small loss in efficiency. However, it is not sufficient to allow maintenance work on the undercarriage or motor to be performed by un-

protected personnel. First echelon decontamination is performed on the order and under the supervision of the vehicle commander.

(2) *Second echelon.*—Second echelon decontamination is performed by the crew of the vehicle and specially trained men in company headquarters with the equipment carried by the company. It is done after first echelon decontamination has been completed. Second echelon decontamination if efficiently performed, makes the vehicle safe for the crew. Maintenance personnel can then perform their work without protection. The amount of decontaminating equipment and material carried by the company is sufficient to decontaminate thoroughly about one-half of the vehicles. Second echelon decontamination is carried out on the order and under the supervision of the company commander.

(3) *Third echelon.*—Third echelon decontamination is performed at decontaminating points in maintenance areas, by maintenance personnel on contaminated vehicles that are sent directly to the maintenance parks for mechanical repair. Third echelon decontamination is thorough and is done quickly by crews of the disabled vehicles and operators of power-driven equipment using equipment and material normally carried by maintenance units. Third echelon decontamination is carried out on the order and under the supervision of the maintenace unit commander.

(4) *Mass.*—The equipment and material carried in companies is not sufficient to decontaminate all vehicles when they have been heavily contaminated. In cases where units have been contaminated by a large-scale gas attack, it may become necessary to distribute additional material and organize the entire unit for decontamination. First, second, and third echelon decontamination methods are employed. Mass decontamination is normally carried out by the orders and under the supervision of the regimental or higher commanders.

SECTION II

MATERIALS AND EQUIPMENT

■ 8. MATERIALS.—*a. DANC M–4.*—(1) Decontaminating agent, noncorrosive, is commonly called "DANC." Two types, M–4 and M–3, may be used by the Armored Force. DANC M–4

is standard for use in apparatus, decontaminating, in the Armored Force. It is noninflammable and noncorrosive to metals except when left in contact for a considerable period of time in the presence of moisture. It does not affect fabric or leather but will decompose rubber and plastics if left in contact for any length of time. It should never be used on the eyelens of the gas mask as the transparency of the lens will be destroyed. It neutralizes all known persistent chemical agents immediately. It evaporates quickly and little discoloration of surfaces is left. Its fumes are toxic, and the gas mask should be worn when it is being used. It irritates the skin if left in contact with it for any length of time. When prepared for use it is a liquid and is effective only for about 6 months.

(2) It is shipped in compartmented containers with active agent in dry powder form in one compartment and the solvent in a separate compartment. In this container it will keep indefinitely. The amounts in each container are in the proper proportions to be mixed and form 5 gallons of DANC. It should be stirred thoroughly while being mixed and should be strained when poured into the apparatus, decontaminating. Personnel should adjust gas masks before mixing and loading DANC.

b. DANC M–3.—This is similar in action to DANC M–4 and is shipped in the same type of container. It is not standard for the Armored Force but might have to be used in case of a shortage of M–4. It leaves a white coating on the surface of the vehicle after its use, similar in appearance to whitewash, and this must be rubbed off immediately before it sets; otherwise it must be removed with an abrasive or steel brush.

c. Chloride of lime.—(1) This agent is standard for decontamination of undercarriages of vehicles and also for the decontamination of rubber and plastic items of equipment. It destroys fabric and leather items and corrodes bright metal surfaces. Therefore, it must not be used on the working parts of weapons or in the engine compartment. It deteriorates slowly in contact with air and moisture and should be kept in the airtight metal container in which it is shipped until it is to be used. In dry powder form it is not very effective, as it is difficult to get it into close contact with

persistent gas. Furthermore, if it is brought into close contact with mustard gas in liquid form, the reaction is violent and heat is generated.

(2) When chloride of lime is to be used to decontaminate the undercarriages of vehicles that have been cleaned of mud or to decontaminate rubber or plastic items or equipment, it is mixed with water to form a slurry (a thin watery mixture). Chloride of lime slurry is prepared by mixing

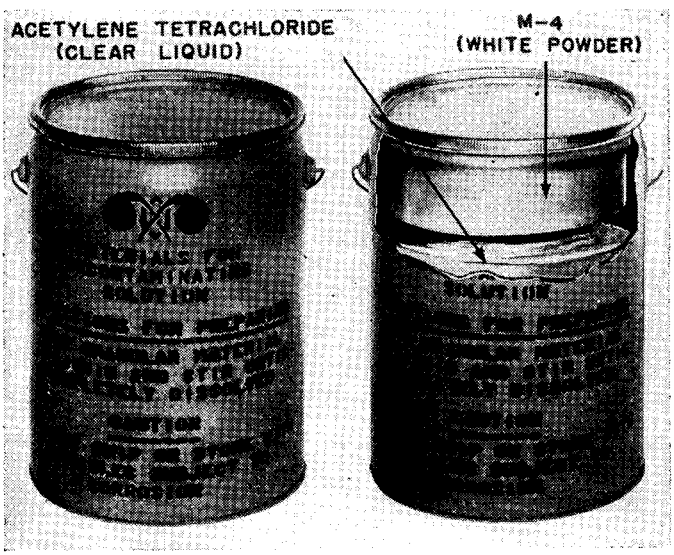

FIGURE 1.—Container DANC.

four parts chloride of lime with three parts water, by volume. In preparing this slurry, a small amount of water should first be added and the lime worked into a paste. When all lumps are worked out, the remainder of the water is added and the slurry thoroughly stirred for several minutes. Chloride of lime may be added to mud to form a mud-lime slurry. This is done when it is necessary to decontaminate the undercarriages of tanks by wallowing them rather than taking time to clean off the surfaces first. In preparing a mud-lime slurry course, 4 pounds of chloride of lime per lineal yard of

the course is scattered over the mud. 200 pounds of chloride of lime are sufficient to prepare a course 50 yards long.

(3) Chloride of lime destroys persistent chemicals effectively but rather slowly. It is a satisfactory method in second echelon and mass decontamination but is too slow for third echelon decontamination when it is desired to start maintenance work immediately.

d. Other materials.—(1) *Water.*—Water will hydrolyze Lewisite quite rapidly, causing the agent to cease to give off toxic vapors. However, it leaves a toxic coating in powder form which on contact will produce burns almost as serious as the agent itself. Therefore water should not be used for decontamination unless nothing better is available.

(2) *Gasoline.*—Gasoline will dissolve liquid persistent chemicals and may also be used to burn them off metal surfaces.

(3) *Diesel fuel.*—This heavier oil may be used to dissolve the liquid chemicals; however, it cannot be used to burn them off.

(4) *Rags.*—Rags and cotton waste issued for cleaning purposes are required in wiping off weapons and the interior of vehicles with DANC and for the same purpose with lime slurry in decontaminating rubber and plastic items of equipment. They are the most readily available materials from which to make torches to be dipped into gasoline for swabbing and burning off contaminated surfaces. Two or three swabs, made by tying or wiring rags or waste to one end of a light stick about 24 inches long, should be available in vehicles for immediate use.

■ 9. EQUIPMENT.—*a. Apparatus, decontaminating, 1½-quart (decon–1½).*—This is a small, hand-operated, fire-extinguisher type apparatus used for spraying agent, decontaminating, noncorrosive (DANC). It is normally carried filled with DANC M–4 and is kept ready for instant use. If it is not used in 6 months it must be refilled. The nozzle should be examined at frequent intervals and, if necessary, should be cleaned out with a knife or wire to prevent it from becoming plugged or corroded.

b. Apparatus, decontaminating, hand, 3-gallon pressure type (decon–3).—This is a portable, hand-operated apparatus used for spraying DANC. It is normally carried in the com-

FIGURE 2.—Apparatus, decontaminating, 1½-quart capacity (decon–1½).

pany supply truck. When chemical agents are being used by the enemy this apparatus is normally carried loaded. Before chemical agents come into general use it is normally carried empty. If loaded and not used it must be refilled each 6 months. It is operated by pumping the handle 20 to 25 strokes which builds up a pressure in the container. The shut-off valve is then opened and the spray is operated until the pressure runs low, at which time the pressure must again be built up by the use of the pump. Some early models of

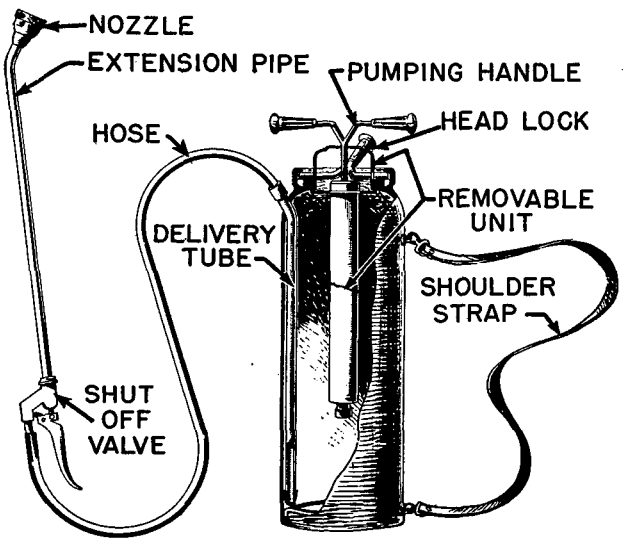

FIGURE 3.—Apparatus, decontaminating, hand, 3-gallon pressure type (decon–3).

this apparatus have a screen in the bottom of the delivery tube. This screen should be removed. After the apparatus is used the nozzle should be unscrewed and cleaned.

c. Apparatus, decontaminating, power-driven (decon–PD).—(1) This apparatus is transported on a 2½-ton, 6 by 6 truck chassis and is operated by a power take-off from the truck motor. It is contained in the equipment of maintenance companies in the Armored Force. It has a tank

capacity of 400 gallons. It can be used to pump from the tank container or directly from a pond or stream. It can be used with spray nozzles to spray chloride of lime slurry, or it can be used with a jet nozzle to throw water at 600 pounds per square inch pressure for the purpose of rapidly cleaning mud from vehicles.

(2) Before chloride of lime is loaded into this apparatus, external surfaces should be lightly oiled with crank case drainings, using rags to apply the oil. After lime slurry is used the apparatus should be cleaned by filling with water up to agitator shaft and pumping out two or three times. The tank should always be kept about half full of water to prevent opening of seams.

d. Cleaner, high pressure, chemical and steam.—This apparatus is a quartermaster item of equipment, issued to certain maintenance units. When available in the field it is useful in decontaminating for the removal of heavy coatings of grease and oil, particularly from the engine compartment.

e. Other equipment.—(1) Cleaning brushes normally carried in tanks are useful in cleaning the vehicle so that the DANC can be applied directly to the metal surface. When these brushes are used for this purpose they must be decontaminated with DANC before they are placed back in the tank.

(2) When operating during rainy seasons over terrain that is normally muddy, a scraper hook for the removal of mud and debris should be improvised and carried with the pioneer tool equipment. This tool can be made by company mechanics, when materials are available, with a scraper in the general form of a putty knife approximately 4 inches wide on one end of a straight handle approximately 40 inches long, to the other end of which is attached a hook measuring approximately 6 inches from point to shank.

■ 10. TESTING EQUIPMENT.—It is known that the enemy possesses a new type of vesicant gas, known as HN–2, which is about as effective as the present well-known mustard gas, but is colorless and almost odorless. This agent is difficult to detect as it may be mistaken for rain or dewdrops. Since armored vehicles frequently get dewdrops on them from vegetation in the early morning hours, it is necessary to have

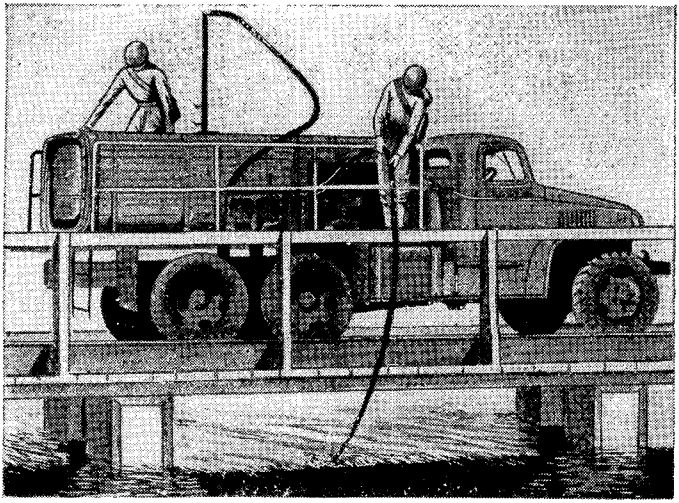

FIGURE 4.—Loading power-driven decontaminating apparatus (decon-PD) with water.

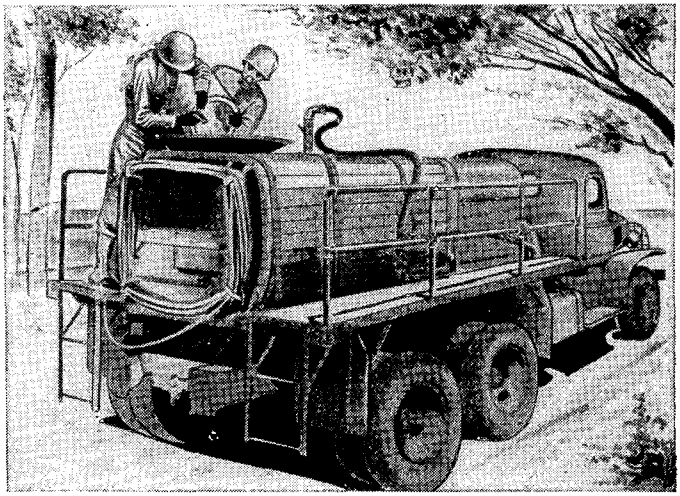

FIGURE 5.—Loading power-driven apparatus (decon-PD) with chloride of lime.

certain positive means for indicating the presence of vesicant gas.

a. Paint, liquid vesicant detector.—(1) This paint is conventional olive drab in color. When drops of liquid vesicant chemicals come in contact with it, the affected spots turn red for all known vesicant agents. It is used by painting a panel on the front apron of the tank or the hood of other vehicles to warn personnel of the presence of vesicant agents. It should also be used in the interior of tanks to paint small panels just below the ring of the turret and at points around doors to warn the crew of the presence of liquid chemicals in the tank.

(2) Detector paint will not give warning of the agent in vapor form.

(3) Detector paint should be removed and replaced with a new coat every 14 days, or after a gas attack.

b. Crayon, vesicant detector.—This item has the appearance of an ordinary piece of red chalk for blackboard use. It is slightly more fragile and crumbles more easily. It is protected by a wrapping of heavy paper which must be peeled down as the crayon becomes worn by use. This item is of particular value in testing for the presence of liquid vesicant chemicals on metal surfaces. It will find its greatest application in case of emergency repairs when it is uncertain as to whether or not it is safe to touch the parts of the vehicle that need adjustment or repair. The crayon is applied to the parts in question by making marks as with ordinary chalk. If the color of the marks remains red the surface is safe to handle. If the color of the marks changes to blue there is a vesicant chemical present.

c. Kit, HS vapor detector.—This apparatus is for the purpose of testing air for the presence of mustard gas in vapor form. It is furnished to all unit gas officers and certain gas noncommissioned officers in the Armored Force. It may be used to test the air inside of vehicles, particularly tanks, for the presence of gas after they have been decontaminated as a check on the thoroughness of decontamination. It is also used to test the air in wooded areas which are reconnoitered for bivouac areas or for the concealment of maintenance parks, distributing points, etc. When gas is present in the air the contents of the test tube turn blue in

color after being heated by the flame from a match and treated with a reagent. Directions for its operation are contained in the lid of the container.

SECTION III

PROCEDURE

■ 11. GENERAL.—It must be kept constantly in mind that the primary purpose in decontamination is not to remove the persistent chemicals from the equipment and vehicle, but rather to allow the enemy's use of them to interfere as little as possible with operations. This basic fact calls for speed in all echelons of decontamination and in first echelon decontamination calls for the removal of only that portion of the chemical on the equipment and vehicle which interferes with the efficient functioning of the crew in the vehicle. All personnel must be familiar with the various steps in first echelon decontamination of the vehicle to which they are assigned. However, certain individuals should have definite assigned duties in order to save the time required for the vehicle commander to give instructions in each case. These assigned duties may be varied from time to time to fit changing conditions.

■ 12. FIRST ECHELON.—*a. Light tanks.*—(1) *Equipment.*

One 1½-quart apparatus, decontaminating, filled with DANC.

Gasoline.

Rags or waste (two or three swabs made by tying or wiring rags or waste to one end of light sticks of wood 18 to 24 inches long).

One crayon, detector.

(2) *Procedure.*—(*a*) When a chemical attack is believed to be imminent, close the tank if it is open. When tank is contaminated, adjust masks immediately. Any first-aid measures made necessary by the action of the gas before gas masks were put on are taken at once. As soon as conditions permit, the head, upper body, and arms of personnel are inspected for drops of liquid chemical that may have entered the tank. The tank commander and assistant driver inspect the driver. The tank commander and the gunner inspect each other, and the gunner inspects the assistant driver.

Any drops found are wiped off and protective ointment is applied on the contaminated spots in accordance with instructions on the tube.

(b) If contamination is from air attack or explosion of shell or bomb, gunner hands decon–1½ to tank commander and holds three cloths or pieces of waste to be saturated with DANC. Tank commander saturates cloths with DANC. Gunner hands one cloth to assistant driver and one to driver who wipe around cracks and openings as much as possible while tank continues moving. Driver devotes his attention to driving the tank, but while doing so wipes off his controls and surfaces around door in front of him where liquid chemical may enter. Gunner wipes off 37-mm gun and inside of turret with particular attention to the surface at the bottom of the turret ring. The tank commander tests likely places with crayon and points out to gunner any additional surfaces that may need to be decontaminated. Cloths may have to be saturated several times if liquid chemical has entered into the turret.

(c) When it is believed that the tank has passed out of the contaminated area and the tactical situation is such that the tank can be stopped for 2 or 3 minutes without undue danger of exposing personnel, the tank is turned facing into the wind and stopped. Turret door is opened, gunner wipes off edge of turret with rag saturated with DANC. Gunner vaults to sitting position on turret and takes decon–1½ and swab from tank commander. Gunner sprays DANC on front of turret, climbs out of turret, spraying and swabbing a clear path in front of him as he advances. Spray is moved continuously across the surface to secure even distribution and to conserve DANC. Tank commander follows gunner with swab, spreading DANC over tank as gunner sprays it from decon–1½. Gunner and tank commander clean off front of tank and weapons with particular attention to surfaces around points where air enters tank and around edges of driver's and assistant driver's doors. Gunner works around front of tank to other side and sprays around turret ring. When front of tank has been sprayed, driver's and assistant driver's doors are opened to allow air to pass through tank and speed up clearing the tank of DANC fumes. The glass in vision slits and periscopes must be wiped off from the outside with a

dry cloth to prevent fogging when decontamination of front of tank is completed.

(*d*) While tank commander and gunner work outside, driver and assistant driver clean up inside of tank, assistant driver moving into rear compartment to do any additional work necessary there. Detector crayon is used to recheck machine guns, controls, 37-mm gun, ammunition, and walls of turret and crew compartment for satisfactory decontamination. Any further decontaminating indicated is performed at once.

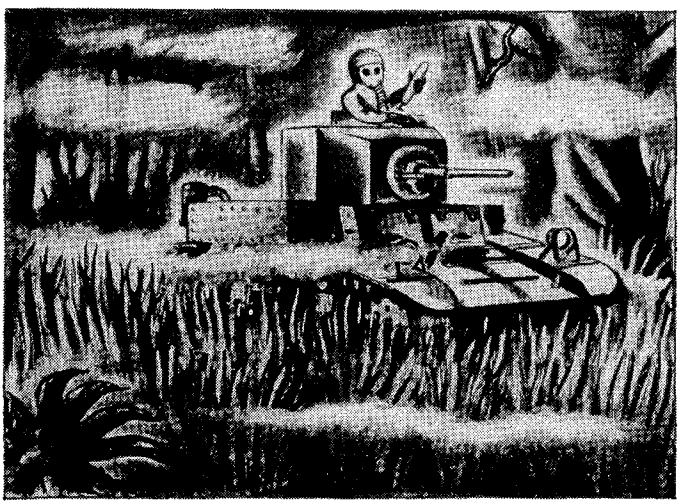

FIGURE 6.—Do not stop the tank as soon as it is contaminated. Continue until out of the contaminated area. If you decontaminate while in the area, tank will be recontaminated from vegetation when you start.

(*e*) At the conclusion of the decontamination work, all weapons, instruments, and machined surfaces which have been treated with DANC are reoiled by wiping with oily waste. Then all waste and rags used are thrown away.

(*f*) Gas masks must be worn until DANC fumes have disappeared from tank. This time will vary widely with the temperature, being less on warm days. If the tactical situation permits, the tank can be cleared of these fumes

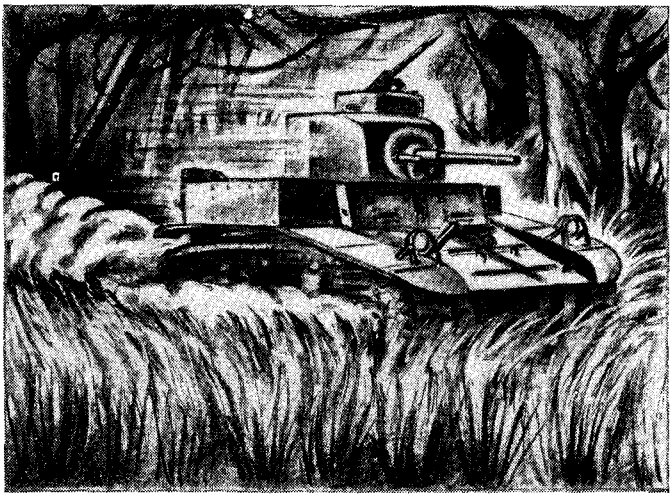

FIGURE 7.—When tank has become contaminated, carry out your mission wearing gas masks and protective gloves. Decontaminate interior of tank as you continue on your mission.

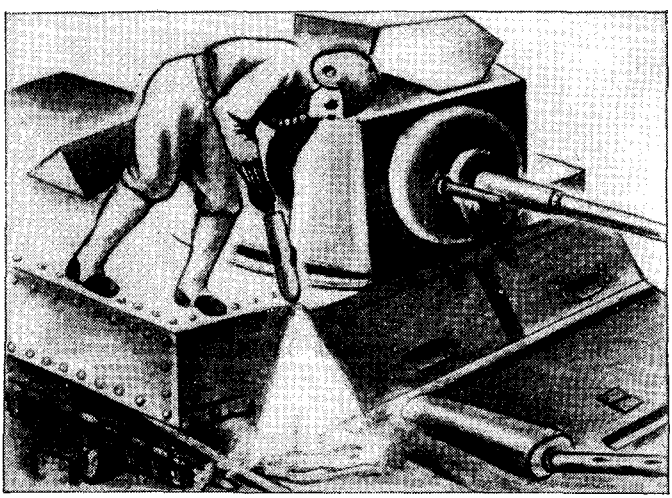

FIGURE 8.—Decontaminate surface of tank in front of you as you go, being sure you are standing on decontaminated surface.

much more quickly if run for the first few minutes with doors open to increase the flow of air through the crew compartment. When the strong odor of DANC fumes is not detected when testing for gas, the gas mask may be removed. This will vary from 10 to 30 minutes according to temperature and amount of air that has passed through the tank.

(3) *Alternate methods.*—(*a*) In case DANC is not available the tank can be decontaminated reasonably well by using

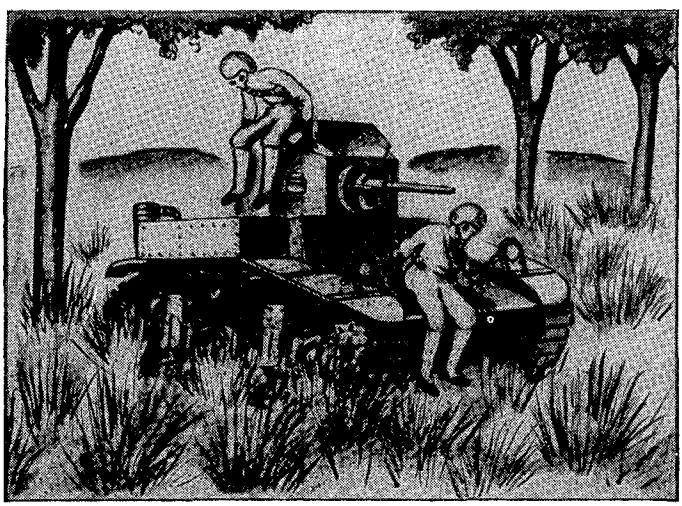

FIGURE 9.—Do not touch, walk on or sit on surfaces before they are decontaminated. You will become contaminated and carry the agent back into the tank. The amount of agent you will get on your clothing in touching, sitting on, or sliding off a tank will be so great that, coupled with the rubbing-in action, it will penetrate the protective clothing and burn the skin.

gasoline, but it will take much longer. The use of gasoline on interior surfaces is dangerous because of the subsequent fire or explosion hazard.

1. Interior should be wiped with cloths saturated in gasoline and then thoroughly wiped with dry cloths. Gasoline does not destroy the chemical but dissolves it and assists in its removal by

mechanical means. This procedure should be carried out at least twice and then results should be thoroughly checked with crayon detector for evidence of places requiring further cleaning. After using gasoline on the interior surfaces, thoroughly ventilate the crew compartment to eliminate danger of fire or explosion.

2. Exterior of tank which carries the bulk of the agent should be dampened with gasoline and burned

FIGURE 10.—When burning off chemical agent, decontaminate a small panel at one time with a small amount of gasoline. Stand on the *ground* up wind from the surface being decontaminated so that the flames and heavy vapor concentrations will be blown away from you.

off. Two members of the crew should wrap their shoes in rags before dismounting and discard the rags before reentering tank. Be sure to work on up wind side of tank. One member applies gasoline with swab over a small portion of the surface. The other member ignites it with lighted swab. The lighted swab should be rubbed across the surface several times as

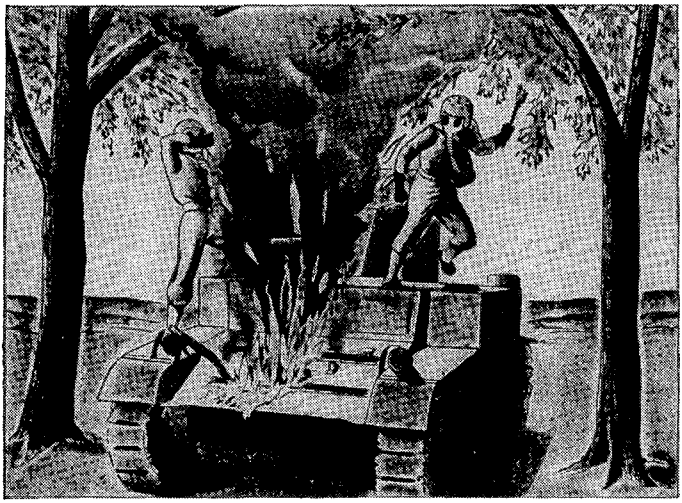

FIGURE 11.—Do not attempt to burn off tank from above.

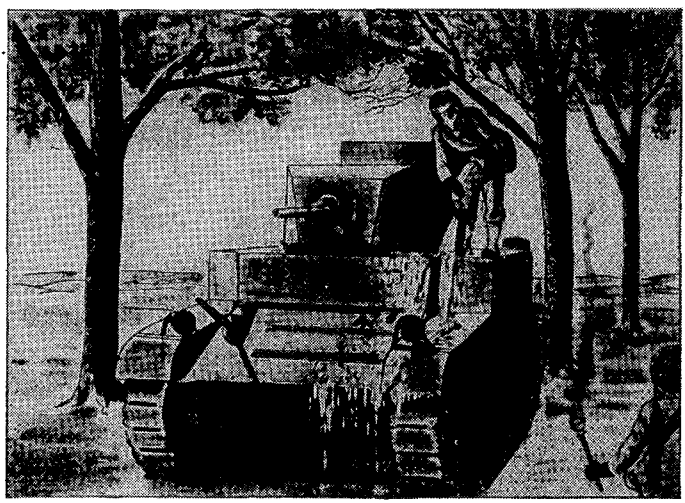

FIGURE 12.—Do not pour a large quantity of gasoline on the tank. Some of it will probably run into tank through openings, carrying the chemical with it. Used in large quantities it is a fire hazard.

the first flash of the gasoline does not furnish sufficient heat to drive off all the chemical. This process is continued until all the necessary surface is burned over. The procedure must be carried out twice. The gasoline should not be poured over the tank in large quantities as it may run into the tank around openings, carrying the chemical into the tank with it and creating a dangerous fire hazard.

(*b*) When neither DANC nor gasoline is available, Diesel oil may be used.

1. Proceed as with gasoline on interior.
2. Exterior is treated in a similar manner to the interior. Since the exterior will be much more heavily contaminated than the interior, the process of alternately washing off with oil and rubbing with dry cloths or waste will probably have to be repeated several times.

b. Medium tanks.—(1) *Equipment.*

Two 1½-quart apparatus, decontaminating, filled with DANC.

Gasoline.

Rags or waste (four or more swabs made by tying or wiring rags or waste to one end of light sticks of wood 18 to 24 inches long).

One crayon, detector.

(2) *Procedure for medium tank M3.*—(*a*) When a chemical attack is believed to be imminent, close the tank if it is open. When tank is contaminated adjust masks immediately. Any first-aid measures made necessary by the action of the gas before gas masks were put on are taken at once. As soon as conditions permit, the head, upper body, and arms of personnel are inspected for drops of liquid chemical that may have entered the tank. Tank commander inspects 37-mm gunner who in turn inspects tank commander; 37-mm gunner inspects the radio operator; the radio operator inspects the driver, and the 75-mm leader and 75-mm gunner inspect each other. Any drops found are wiped off and protective ointment is applied on the contaminated spots in accordance with instructions on the tube.

(*b*) If contamination is from air attack or explosion of shell or bomb, radio operator takes decon–1½ and saturates six rags or pieces of waste held by the 75-mm gunner. The 75-mm gunner then hands saturated cloth to each member of the crew. While these cloths are being sprayed with DANC, 75-mm loader takes second decon–1½ from its stowage place. Driver devotes his attention to driving tank, but while doing so wipes off his controls, surfaces around door, and around any points in front of him where liquid chemical may enter. Radio operator, 75-mm gunner, and 75-mm loader wipe inside of turret ring near them. All crew members devote their attention to area around them, the 75-mm gunner giving particular attention to inside surfaces around his gun mount. The 75-mm loader pays particular attention to inside of hatch above him. The tank commander supervises checking of surfaces with detector crayon, and any additional work indicated is performed. Cloths may have to be saturated several times if liquid chemical has entered the turret.

(*c*) When it is believed that the tank has passed out of the contaminated area and the tactical situation is such that the tank can be stopped for 2 or 3 minutes without undue danger of exposing personnel, the tank is turned facing into the wind and stopped. The 75-mm loader opens hatch above him and wipes off edge of hatch opening with rag saturated with DANC. He then vaults to a sitting position on hatch cover and takes decon–1½ and swab from 75-mm gunner. The 75-mm loader sprays DANC and swabs off area on which to stand. The 75-mm gunner then climbs through open hatch with swab to assist in decontaminating. Spray is moved continuously across the surface to secure even distribution and to conserve DANC. The 37-mm gunner turns turret two complete revolutions while 75-mm loader and 75-mm gunner spray and swab front of turret rings and top hatch. On first revolution lower turret ring and front of turrets are decontaminated. On second revolution the ring at base of cupola, front of cupola, and top hatch are decontaminated. The men on outside of tank must watch 37-mm gun when turret revolves to avoid being knocked off the tank. The 75-mm loader and 75-mm gunner then work down right front and over to left of tank, spraying and swabbing as they

advance. Particular attention is given to points where air enters tank, including 75-mm gun mount and areas around driver's door. When front of tank has been sprayed, driver's door is opened so that air may pass through tank and speed up clearing tank of DANC fumes. If second decon–1½ is needed, it can be passed through driver's window. The glass in vision slits and periscopes must be wiped off from the outside with a dry cloth to prevent fogging when decontamination of front of tank is completed.

(*d*) At the same time, driver and radio operator recheck condition of driving controls, radio, and 75-mm gun, using crayon detector. The tank commander rechecks guns, ammunition, and walls of his turret. Any further decontaminating indicated is performed at once.

(*e*) At the conclusion of the decontamination work all weapons, instruments, and machined surfaces which have been treated with DANC are reoiled by wiping with oily waste. Then all waste and rags used are thrown away.

(*f*) Gas masks must be worn until DANC fumes have disappeared from tank. This time will vary widely with the temperature, being less on warm days. If the tactical situation permits, the tank can be cleared of these fumes much more quickly if run for the first few minutes with doors open to increase the flow of air through the crew compartment. If the strong odor of DANC fumes is not detected when testing for gas, the gas mask may be removed. The time will vary from 10 to 30 minutes according to the temperature and amount of air that has passed through the tank.

(3) *Procedure for medium tank M4.*—(*a*) When a chemical attack is imminent, close tank if it is open. When tank is contaminated adjust masks immediately. Any first-aid measures made necessary by action of the gas before gas masks were put on are taken at once. As soon as conditions permit, the head, upper body, and arms of personnel are inspected for drops of liquid chemical that may have entered the tank. Tank commander inspects the gunner and the loader; in turn, the gunner inspects the tank commander; the driver inspects the assistant driver, and the assistant driver inspects the driver. Any drops found are wiped off and protective ointment is applied on the contaminated spots in accordance with instructions on the tube.

(*b*) If contamination is from air attack or explosion of shell or bomb, loader takes decon–1½ and hands it to tank commander. Loader then holds four cloths or pieces of waste to be saturated with DANC. Tank commander saturates cloth with DANC. Loader hands two cloths to driver who gives one to assistant driver. Loader also hands one cloth to gunner. Driver devotes his attention to driving tank and while doing so wipes off his controls, surfaces around hatch, and around any points where liquid chemical may enter. Assistant driver wipes around ventilator and around his hatch. Gunner wipes inside surfaces on his side of 75-mm gun and gun mount, and around turret ring and turret walls near him. Loader wipes off his side of 75-mm gun and mount, turret ventilator, periscope, and turret ring and turret walls near him. Tank commander wipes around inside of top hatch and also gives attention to turret ring and turret walls. The tank commander tests likely places with detector crayon and points out to gunner and loader any additional surfaces that may need to be decontaminated. Cloths may have to be saturated several times if liquid chemical has entered into the tank.

(*c*) When it is believed that the tank has passed out of the contaminated area and the tactical situation is such that the tank can be stopped for 2 or 3 minutes without undue danger of exposing personnel, the tank is turned facing into the wind and stopped. Tank commander opens turret hatch, wipes off edge of turret opening with rag saturated with DANC, and vaults to a sitting position on turret. Loader hands decon–1½ and swab to tank commander. Tank commander sprays DANC and swabs off sufficient area on top of turret to provide a place to stand while additional areas are sprayed. Spray is moved continuously across the surface to secure even distribution and to conserve DANC. Loader climbs through turret opening, taking swab with him, and assists tank commander. Tank commader and loader work down left front of tank and over to right front, spraying and swabbing in front of them as they advance. Particular attention is given to surfaces around points where air enters into the tank and around edges of driver's and assistant driver's doors. Base of turret ring can be sprayed when standing on left and right spon-

sons. Second decon–1½ may be used when DANC in first is exhausted. When front of tank has been decontaminated, driver's and assistant driver's doors are opened so that air may pass through tank and speed up the removal of DANC fumes. The glass in vision slits and periscopes must be wiped off from the outside with a dry cloth to prevent fogging when decontamination of front of tank is completed.

(*d*) At the same time, driver and assistant driver recheck condition of driving controls and weapons, using crayon detector for this purpose. The gunner rechecks guns and ammunition and walls of turret. Any further decontaminating indicated is performed at once.

(*e*) At the conclusion of the decontamination, all weapons, instruments, and machined surfaces which have been treated with DANC are reoiled by wiping with oily waste. All waste and rags used are then thrown away.

(*f*) Gas masks must be worn until DANC fumes have disappeared from tank. The time will vary widely with the temperature, being less on warm days. If the tactical situation permits, the tank can be cleared of these fumes much more quickly if run for the first few minutes with doors open to increase the flow of air through the crew compartment. When the strong odor of DANC fumes is not detected when testing for gas, the gas mask may be removed. The time will vary from 10 to 30 minutes according to the temperature and amount of air that has passed through the tank.

(4) *Alternate methods.*—(*a*) In case DANC is not available the tank can be decontaminated reasonably well by using gasoline, but it will take much longer. The use of gasoline on interior surfaces is dangerous because of subsequent fire or explosion hazard.

1. Interior should be wiped with cloths saturated in gasoline and then thoroughly wiped with dry cloths. The gasoline does not destroy the chemical but dissolves it and assists in its removal by mechanical means. This procedure should be carried out at least twice and then results thoroughly checked with crayon detector for evidence of places requiring further cleaning. After using gasoline on the interior surfaces,

thoroughly ventilate the crew compartment to eliminate the danger of fire or explosion.

2. Exterior of tank which carries the bulk of the agent should be dampened with gasoline and burned off. Two members of the crew should wrap their shoes in rags before dismounting and discard the rags before reentering tank. Be sure to work on up wind side of tank. One member applies gasoline with swab over a small portion of the surface. The other member ignites it

FIGURE 13.—Do not stop the tank as soon as it is contaminated. Continue until out of contaminated area. If you decontaminate while in the area, tank will be recontaminated from vegetation when you start.

with lighted swab. The lighted swab should be rubbed across the surface several times, as the first flash of the gasoline does not furnish sufficient heat to drive off all of the chemical. This process is continued until all the necessary surface is burned over. The procedure must be carried out twice. The gasoline should not be poured over the tank in large quantities as it

may run into the tank around openings, carrying the chemical into the tank with it and creating a dangerous fire hazard.

(*b*) When neither DANC nor gasoline is available Diesel oil may be used.

1. Proceed as with gasoline on interior.
2. Exterior is treated in a similar manner to the interior. Since the exterior will be much more heavily contaminated than the interior, the process of alternately washing off with oil and rubbing with dry cloths or waste will probably have to be repeated several times.

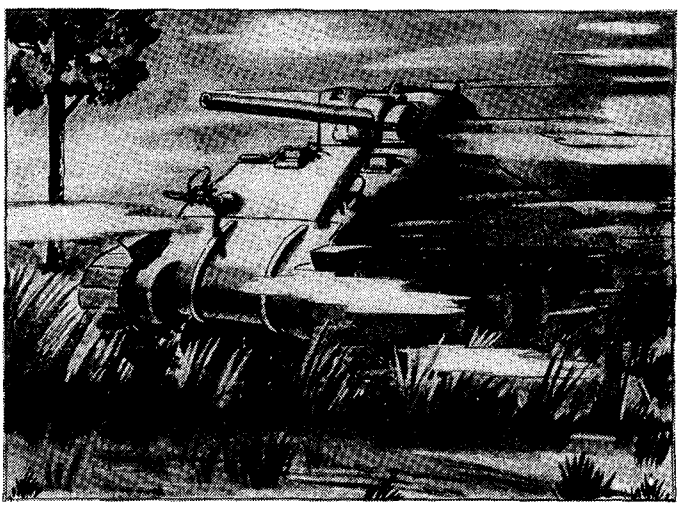

FIGURE 14.—When tank has become contaminated, carry out your mission wearing gas masks and protective gloves. Decontaminate interior of tank as you continue on your mission.

c. Scout car and personnel carrier, half-track.—(1) *Equipment.*

Two 1½-quart apparatus, decontaminating, filled with DANC (in scout cars).

Three 1½-quart apparatus, decontaminating, filled with DANC (in personnel carrier, half-track).

Gasoline.

Rags or waste including three or four swabs made by tying or wiring rags or waste to one end of light sticks of wood 18 to 24 inches long.

One crayon, detector.

(2) *Procedure.*—(*a*) As soon as it is seen that the scout car (or personnel carrier) is to be subjected to airplane spray attack, adjust cellophane covers and mask if time is available; otherwise, mask as soon as firing at airplane has ceased. After adjusting his own cover, car commander assists driver in adjusting his cover. Car commander closes radiator

FIGURE 15.—Do not slide off tank without thoroughly decontaminating a path ahead of you. Sitting on or sliding down contaminated surfaces will grind the liquid chemical into your impregnated clothing in such quantity that it cannot protect you, and serious burns will result.

shutters to prevent spray being pulled into motor compartment. If car is contaminated from explosion of shell or bomb, adjust gas masks immediately. When air attack is over, prepare another cover for immediate use, stop vehicle, and remove cellophane covers as follows: Men on up wind side remove covers successively, commencing with the man in front, and throw them over the down wind side; when

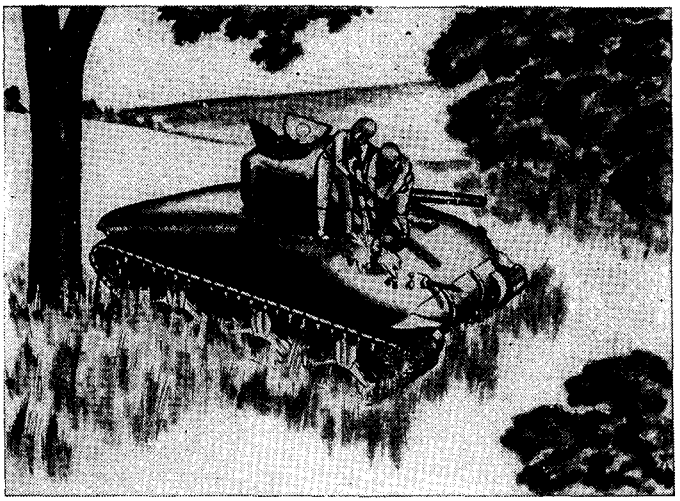

FIGURE 16.—Clean a path ahead of you as you descend so that you will not be contaminated by the gas drops or splashes on the vehicle.

FIGURE 17.—Do not stand where flash of burning gasoline will reach you.

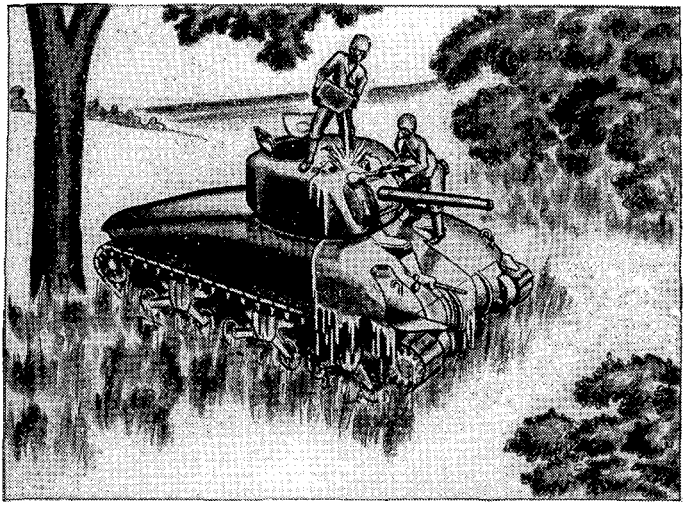

FIGURE 18.—Do not pour gasoline on tank in large quantities. It may seep into tank carrying the chemical agent along with it and also creating a dangerous fire hazard.

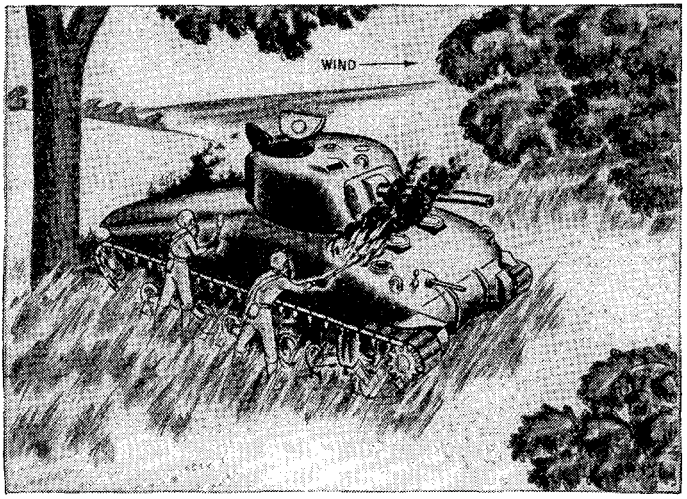

FIGURE 19.—Burn off a small area at a time. Work from up wind so that flames and vapor will not reach you.

this is completed, the men on the down wind side successively remove covers in the same manner and throw them over the side. The car commander removes the driver's cover before removing his own. Car commander then opens radiator shutters. Crew members will immediately be inspected for drops or splashes of liquid chemical on their bodies or clothing. The car commander inspects the driver. Then he and the other crew members acting in pairs inspect each other. Any drops or splashes found are blotted off, protective ointment is applied to the contaminated spots, and any other first-aid measures indicated are taken.

(*b*) When car is contaminated from air attack or shell or bomb explosion, radio operator takes decon–1½ and sprays cloths held by car commander. When cloths are saturated with DANC, car commander hands one to each member in front compartment of vehicle. Each man then proceeds to wipe off contaminated spots from the inside of the car and equipment around him, including contaminated seat cushions. Decon–1½ is used to spray contaminated parts of driver's compartment.

(*c*) The crew member nearest the decon–1½ in the rear of the vehicle applies DANC to cloths held by the crew member opposite him and then sprays contaminated surfaces and equipment. These saturated cloths are distributed to the other crew members in the rear of the vehicle, and all members proceed to swab the inside of the car, the weapons and equipment in their part of the vehicle. The car commander tests for satisfactory decontamination with the detector crayon. Cloths may have to be saturated several times.

(*d*) As soon as it is believed the car has passed out of the contaminated area and the tactical situation permits halting for 2 or 3 minutes, the car is turned sideways to the wind and stopped. Car commander and two or three designated members of the crew with one decon–1½ and swabs dismount, being careful not to become contaminated from the mud guards and ventilating shutters. They first decontaminate the up wind side of the front of the car; the driver then turns the car so that the other side faces into the wind, and that side is decontaminated in a similar manner. Spray is moved continuously across the surface to secure even dis-

tribution and to conserve DANC. Remaining crew members continue to clean the inside of vehicle, including weapons and upper edge of armor plate. Attention is given to tarpaulins used to cover supplies and equipment to make sure they are thoroughly decontaminated. Supplies which have been covered are examined and, if need be, are decontaminated. The crayon detector is used frequently to check progress of the work. Ground mounts for machine guns are sprayed and swabbed.

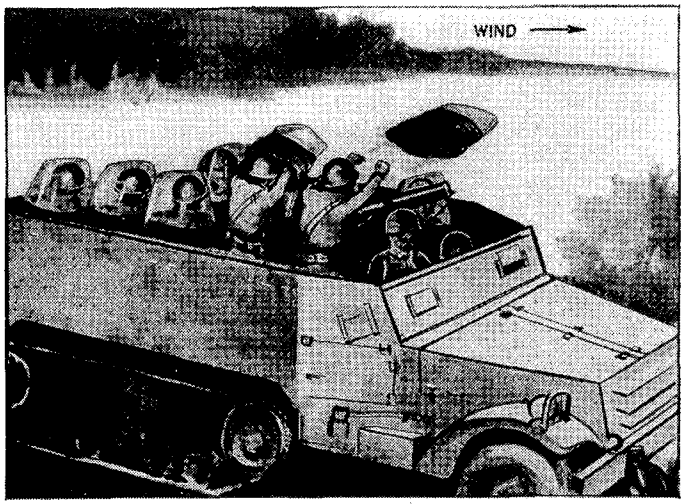

FIGURE 20.—Men on up wind side remove covers successively, commencing with the man in front, and throw them over the down wind side.

(*e*) At conclusion of the decontamination work all weapons, instruments, and machined surfaces which have been treated with DANC are reoiled by wiping with oily waste. Then all waste and rags used are thrown away.

(*f*) It is necessary to continue wearing gas masks until tests for gas show the strong odor of DANC fumes has disappeared. This will ordinarily take only a short time after the vehicle has again been put in motion.

(3) *Alternate methods.*—If DANC is not available, the car

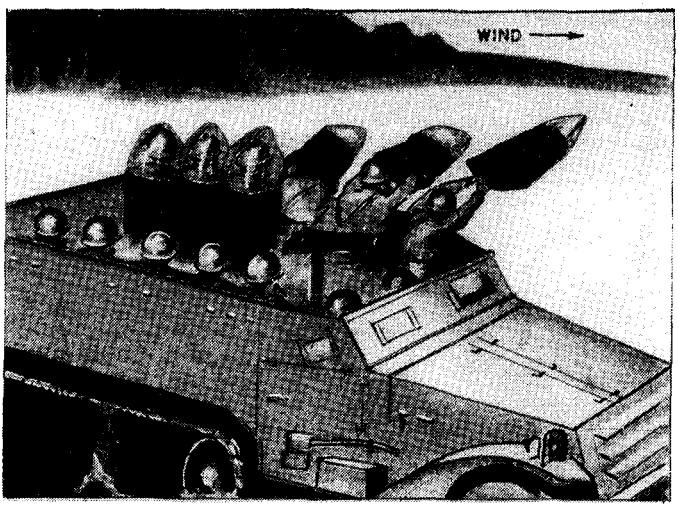

FIGURE 21.—Men on down wind side successively remove cellophane covers and throw them over the down wind side.

FIGURE 22.—Do not remove cellophane covers while vehicle is in motion or disregard direction of wind. Men on down wind side who first remove covers will be contaminated by the covers of the men on up wind side.

can be decontaminated reasonably well by using gasoline, but it will take much longer.

(*a*) Interior should be wiped off with cloths saturated in gasoline and then thoroughly wiped with dry cloths. This procedure should be repeated. The results should be checked with the crayon detector for indication of places requiring further cleaning. Gasoline does not destroy the agent, but dissolves it and makes it easier to remove by wiping off.

(*b*) Outside surfaces on the front of the car can be moistened with gasoline and burned off, though all occupants of

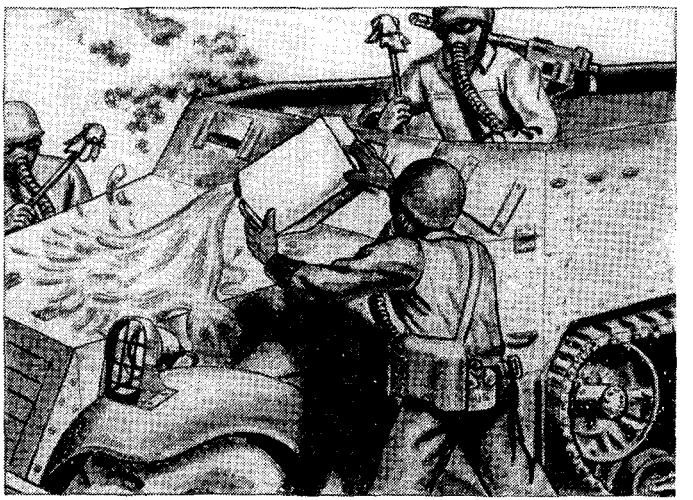

FIGURE 23.—Do not pour large amounts of gasoline over vehicle. It may run down inside, carrying chemical agent into the motor compartment and creating a fire hazard.

vehicle must first dismount. This work must be done on the up wind side of the car. Gasoline is applied with a swab over a small section of the surface, and is ignited with a lighted swab. The lighted swab should be rubbed across the surface several times because the first flash of the gasoline does not furnish sufficient heat to drive off all the agent. The procedure must be carried out twice. After one side of the front has been burned over, the car should be turned so that the other side is up wind, and the process

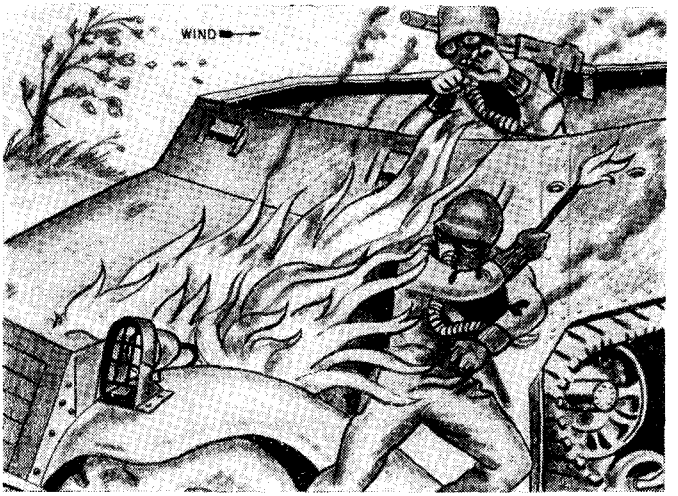

FIGURE 24.—Do not burn from down wind side or you may be seriously burned by flames and by the heavy vapor concentration driven off.

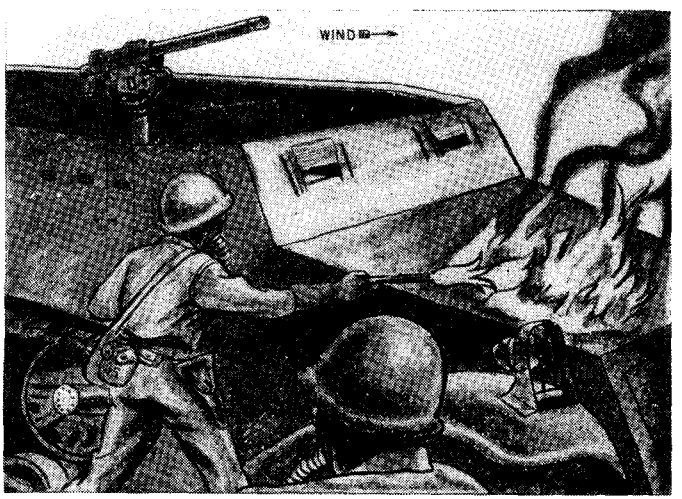

FIGURE 25.—Work from up wind to avoid getting burned. Crew should dismount before burning off.

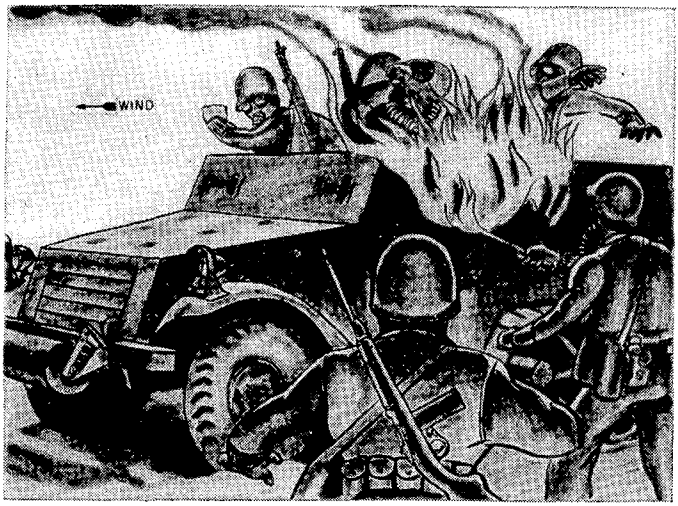

FIGURE 26.—Do not remain in vehicle during burning-off process. Dismount and go up wind.

FIGURE 27.—During burning-off process crew stands up wind. Burn off a small panel at a time.

completed. Gasoline should not be poured over the vehicle in large quantities for it may run into the motor compartment, creating a fire hazard and carrying the agent along with it.

d. Carriages, motor, 75-mm and 105-mm howitzer.—(1) *Equipment.*

Three 1½-quart apparatus, decontaminating, filled with DANC.
Gasoline.
Rags or waste (including two or three swabs made by tying or wiring rags or waste to one end of light sticks of wood 18 to 24 inches long).
One crayon, detector.

(2) *Procedure for carriage, motor, 75-mm howitzer.*—(*a*) As soon as it is seen that the carriage is to be subjected to airplane spray attack, adjust cellophane covers, and mask if time is available; otherwise mask as soon as firing at the airplane has ceased. Driver closes radiator shutters to prevent spray being drawn into motor compartment. If carriage is contaminated from explosion of shell or bomb, adjust gas masks and take any first-aid measures made necessary by the contamination of the crew from the chemical. When air attack is over, prepare another cover for immediate use; stop vehicle, and remove cellophane covers. The men on up wind side remove covers first and throw them over the down wind side; then men on the down wind side remove covers in a similar fashion. Driver opens radiator shutters. Crew members will immediately be inspected for drops or splashes of liquid agent on their bodies or clothing. The car commander inspects the driver. Crew members, acting in pairs, inspect each other. Any drops or splashes found are blotted off, protective ointment is applied to the contaminated spots, and other necessary first-aid measures are taken.

(*b*) When carriage is contaminated from air attack or explosion of shell or bomb, car commander takes one decon-1½ and saturates with DANC necessary rags or pieces of waste held for him by No. 1 cannoneer who then hands the saturated cloths to the various crew members, including the driver. The driver wipes off his controls and swabs any splashes or drops around him which he can reach without interfering with his driving. The crew members in the rear of the vehicle, using saturated cloths, proceed to wipe off

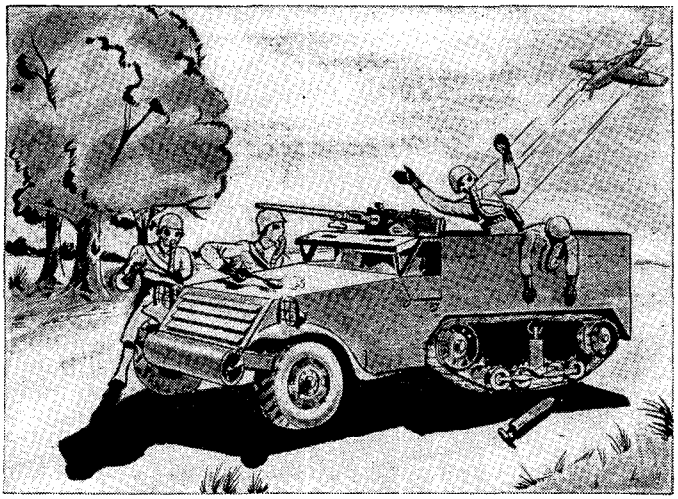

FIGURE 28.—Do not become so intent on decontaminating that an adequate lookout is forgotten.

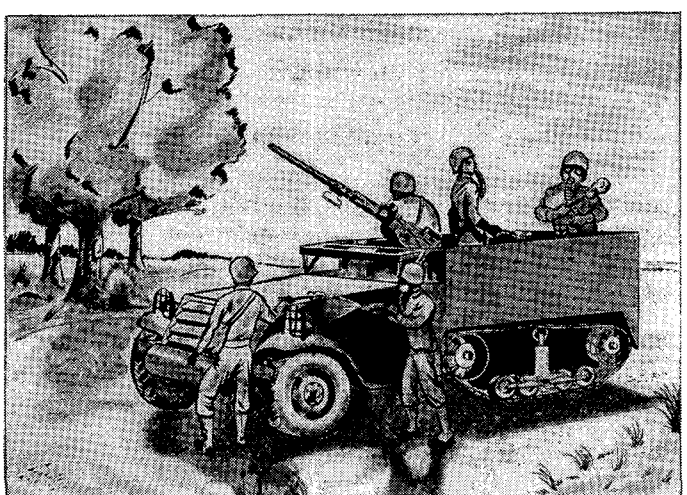

FIGURE 29.—Continue clean-up work but be alert for possible attack.

inside of the car, weapons, and equipment around them. Contaminated seat cushions are also swabbed. During this time No. 2 cannoneer is spraying badly contaminated spots, using the second decon–1½. The car commander tests for satisfactory decontamination with the detector crayon. Cloths may have to be saturated several times.

(*c*) As soon as the vehicle has passed out of the contaminated area and the tactical situation permits, the car is turned sideways, so that the driver's side is up wind, and stopped. The Nos. 1 and 2 cannoneers dismount, taking a decon–1½ and swabs, being careful not to become contaminated from the outside of the car. They then decontaminate the left front quarter of the car, including the windshield armor, door, hood, mud guard, and ventilating shutters, using decon–1½ and swabs on sticks. Spray is moved continuously across the surface to secure even distribution and to conserve DANC. After the up wind front quarter of the car has been decontaminated, the driver turns the car so that the other side faces into the wind and this side is decontaminated in the same way. During this time, driver and car commander spray and swab interior of vehicle, including weapons. Attention is given to tarpaulins used to cover supplies and equipment to make sure that they are thoroughly decontaminated. Supplies which have been covered are examined and, if need be, are decontaminated. The crayon detector is used frequently to check progress of the work.

(*d*) At the conclusion of the decontamination work, all weapons, instruments, and machined surfaces which have been treated with DANC are reoiled by wiping with oily waste. Then all waste and rags used are thrown away.

(*e*) Continue wearing gas masks until tests for gas show the strong odor of DANC fumes has disappeared. This will ordinarily take only a short time after the vehicle has moved out.

(3) *Procedure for carriage, motor, 105-mm howitzer.*—(*a*) As soon as it is seen that the carriage is to be subjected to airplane spray attack, adjust cellophane covers and mask if time is available; otherwise mask as soon as firing at plane has ceased. After adjusting his own cover, chief of section assists driver in adjusting his cover. If the carriage is con-

taminated from explosion of shell or bomb, adjust gas masks and take any first-aid measures made necessary by the contamination of the crew from the chemical. When air attack is over prepare another cover for immediate use, stop vehicle, and remove cellophane covers as follows: men on up wind side remove covers successively, commencing with the man in front, and throw them over the down wind side; when this is completed, the men on the down wind side successively remove covers in the same manner and throw them over the side. Chief of section removes the driver's cover before removing his own. Crew members will immediately be inspected for drops or splashes of liquid agent on their bodies or clothing. The chief of section inspects the driver. Crew members acting in pairs inspect each other. Any drops or splashes found are blotted off, protective ointment is applied to the contaminated spots, and any necessary first-aid measures are taken.

(*b*) When the carriage is contaminated from air attack or explosion of shell or bomb, chief of section takes one decon–1½ and saturates with DANC three rags held by gunner who then distributes saturated rags to chief of section and driver, keeping one himself. Other crew members, using remaining two decons–1½, saturate rags and start decontaminating inside of car, weapons, and equipment around them. The driver wipes off his controls and swabs any splashes or drops around him which he can reach without interfering with his driving. Contaminated seat cushions are also swabbed. Crew members use the decon–1½ to spray badly contaminated spots. Chief of section tests for satisfactory decontamination with the detector crayon. Cloths may have to be saturated several times.

(*c*) As soon as the vehicle has passed out of the contaminated area and the tactical situation permits, the vehicle is turned sideways to the wind and is stopped. When car is brought to a halt, driver decontaminates his compartment thoroughly. When No. 1 cannoneer has decontaminated his part of the interior of the vehicle he steps over shield onto front of carriage, spraying and swabbing as he advances. Gunner decontaminates place to stand and steps over shield onto front of carriage. Both men spray and swab front of vehicle, including 105-mm howitzer and surfaces around

driver's door and pistol port. When front of vehicle has been decontaminated, driver's door and pistol port may be opened for ventilation. When decontamination of front of vehicle is completed, glass in vision slit must be wiped off with a dry cloth to prevent fogging. Attention is given to tarpaulins used to cover supplies and equipment to make sure that they are thoroughly decontaminated. Supplies which have been covered are examined and, if need be, are decontaminated. The crayon detector is used frequently to check progress of the work.

(*d*) At the conclusion of the decontamination work, all weapons, instruments, and machined surfaces which have been treated with DANC are reoiled by wiping with oily waste. All waste and rags used are then thrown away.

(*e*) It is necessary to continue wearing the gas masks until tests for gas show the strong odor of DANC fumes has disappeared. This will ordinarily take only a short time after the vehicle has again been put in motion.

(4) *Alternate methods.*—If DANC is not available, the carriages can be decontaminated reasonably well by using gasoline, but it will take much longer.

(*a*) Interior should be wiped off with cloths saturated in gasoline and then thoroughly wiped with dry cloths. This procedure should be repeated, and then the results should be checked with the crayon detector for indication of places requiring further decontaminating. Gasoline does not destroy the chemical, but dissolves it and makes it easier to remove by wiping off.

(*b*) Outside surfaces on the front of the carriage can be moistened with gasoline and burned off, although all personnel must first dismount. This work must be done on the up wind side of the vehicle. The driver applies gasoline with swab over a small section of the surface and then ignites it with a lighted swab. The lighted swab should be rubbed across the surface several times because the first flash of gasoline does not furnish sufficient heat to drive off all the chemical. The procedure must be carried out twice. After one side of the front has been burned over, the vehicle should be turned so that the other side is up wind and the process completed. Gasoline should not be poured over the vehicle in large quantities for it may run into the motor compart-

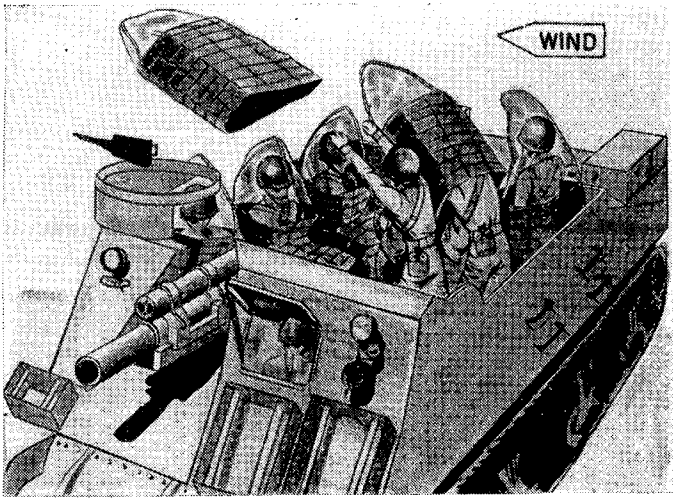

FIGURE 30.—Men up wind remove covers successively, commencing with the man in front, and throw them over the down wind side.

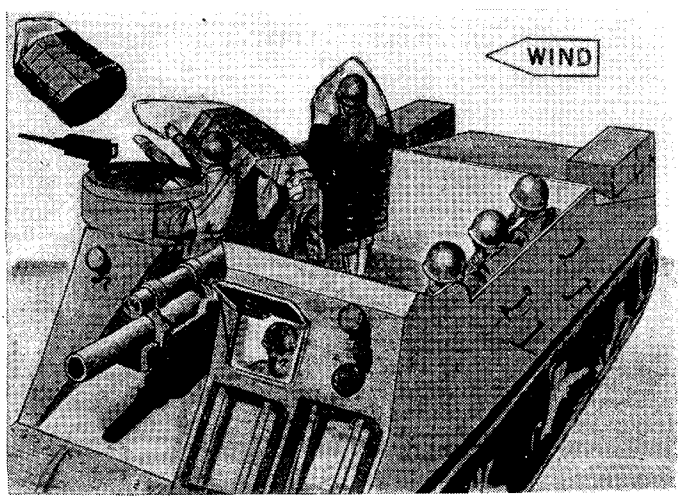

FIGURE 31.—Men on down wind side successively remove cellophane covers and throw them over the down wind side.

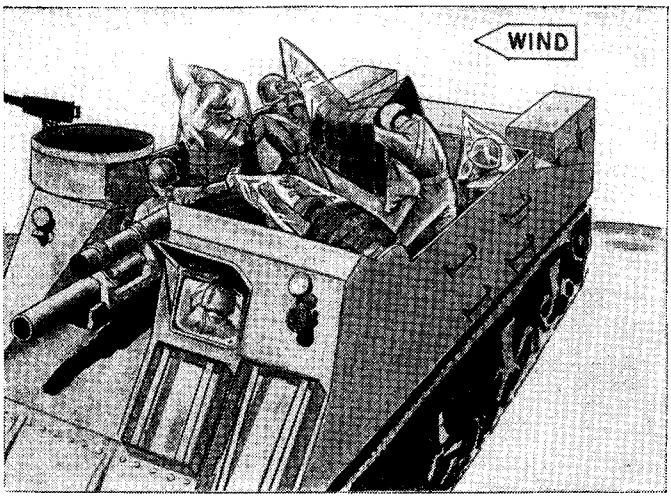

FIGURE 32.—Do not remove cellophane covers while vehicle is in motion or without regard to direction of wind. Men on down wind side who first remove covers will be contaminated by covers of the men on up wind side.

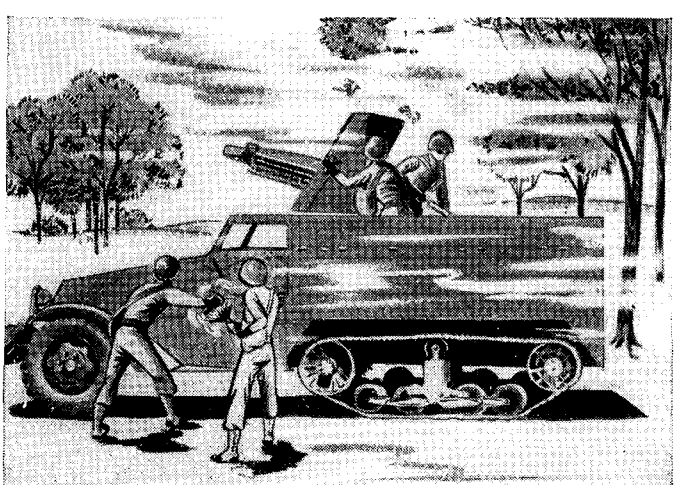

FIGURE 33.—Do not stop in contaminated area.

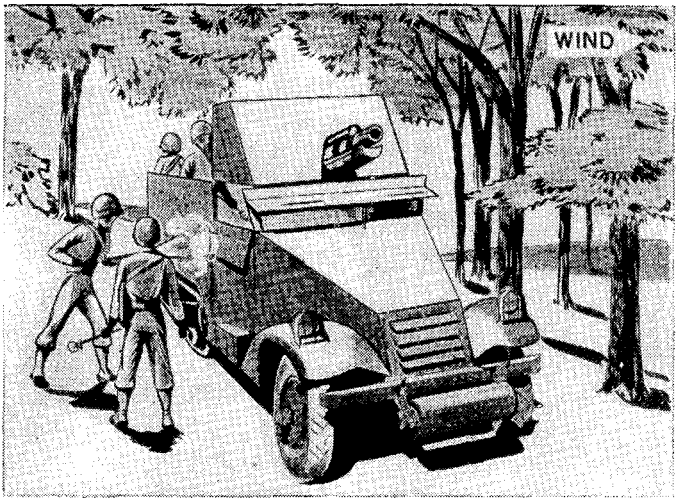

FIGURE 34.—Continue until out of contaminated area, turn sideways to wind, and decontaminate.

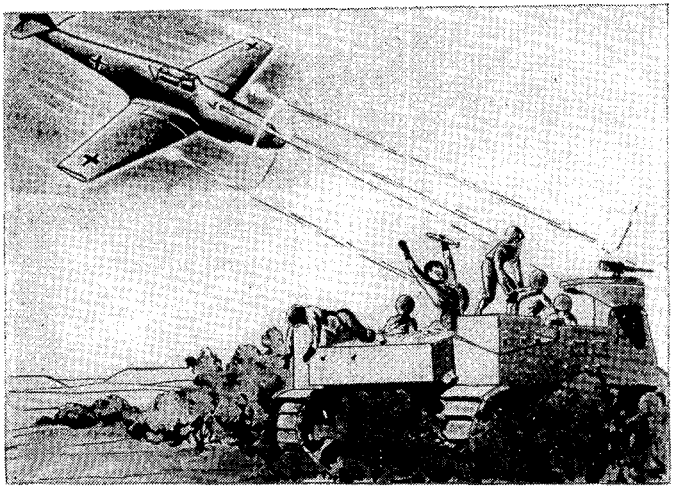

FIGURE 35.—Do not become so intent on decontaminating that an adequate lookout is forgotten.

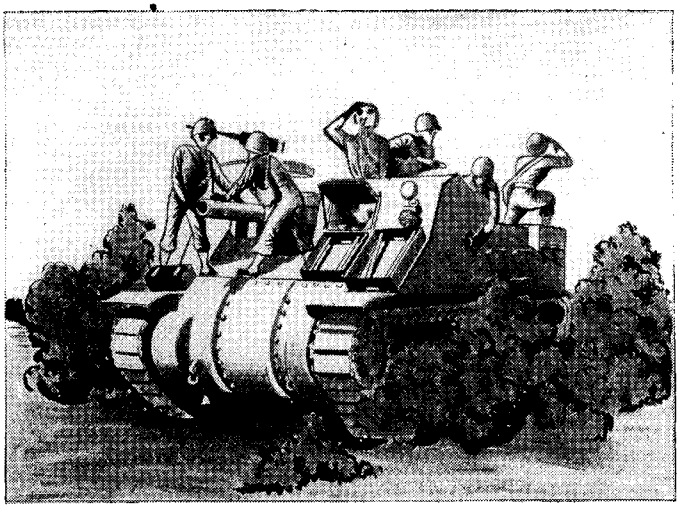

FIGURE 36.—Continue clean-up work, but be alert for possible attack.

ment, creating a fire hazard and carrying the agent along with it.

■ 13. SECOND ECHELON.—*a. Equipment.*—In addition to any material that may be left in vehicles after first echelon decontamination is completed, the company carries for second echelon decontamination—

six decons—three filled with DANC.
200 pounds chloride of lime.
Rags or waste.
Crayons, detector.
Kit, HS vapor detector. (Carried by unit gas officers and certain gas noncommissioned officers.)
Pioneer tools from vehicles.

b. Procedure.—(1) Second echelon decontamination is usually carried out before going into bivouac or at other times when the company supply trucks can be sent forward from the train.

(2) At a halt or when going into bivouac, contaminated vehicles are not sent out with security detachments if suffi-

cient uncontaminated vehicles are available. When it is necessary to send out contaminated vehicles before they can be decontaminated, any available decons–1½ which have not been used in the company are exchanged for empty ones in the vehicles sent out, and the crews are ordered to complete decontamination of their vehicles with DANC as soon as they have arrived at their posts.

(3) The area selected for decontamination should be down wind from the bivouac area, preferably at least ½ mile distant. If vehicles are covered with mud, the area should be near a pond or stream or other source of water where a wallow course can be improvised.

(4) The company gas noncommissioned officer assists the company commander in the lay-out and spotting of equipment for second echelon decontamination.

(5) Vehicles are checked by vehicle commanders with detector crayons under supervision of platoon commanders. Platoon commanders report to the company commander numbers and types of vehicles that require decontamination, are not contaminated, or are doubtful cases.

A spot check of vehicles reported to be not contaminated is made by the company gas noncommissioned officer to verify the report. A careful check of doubtful cases is made, using detector crayon and kit, HS vapor detector, to check for the presence of persistent gas in vapor form which may have been absorbed in grease in or on the vehicle or which has been absorbed by equipment in the vehicle.

(6) All vehicles that are found to be uncontaminated but which have been in gas during the day and have executed first echelon decontamination are ordered to clean weapons and instruments with gasoline and to reoil them. Vehicles not requiring decontamination are dispatched to the bivouac area or removed some little distance up wind from the decontamination area.

(7) The interiors of vehicles are decontaminated first, then the exterior of the body; the undercarriages are decontaminated last.

(8) A decontamination point is established for each platoon. Vehicles of company headquarters are attached to platoons. In case the contamination of vehicles is not uniform, the number of decontaminating points per platoon

is varied in a manner to facilitate the completion of the work in the shortest possible time. If six vehicles or more are contaminated, three decontamination points, each provided with two decons–3 are established.

(9) Two men selected from company headquarters operate the decons–3 at each decontaminating point. Members of the vehicle crews use waste or rags to wipe off parts of vehicle assigned to them in first echelon decontamination. Vehicle commanders detail members of the crew to clean backs of vehicles and engine compartments.

(10) Results are checked by vehicle commanders with detector crayon and doubtful results are checked with the kit, HS vapor detector.

(11) When undercarriages of vehicles are heavily encrusted with mud but not more than four vehicles require decontamination of undercarriages, the decontamination is done by hand methods. Mud is removed by driving the vehicle through water or by removing it with pioneer tools, sticks, or improvised scrapers. Chloride of lime slurry is then applied with cleaning brushes. Mud is then thrown over the slurry. A clay mud is desirable if available. This mud coating removes the undesirable feature of having vehicles with whitewashed undercarriages and also tends to seal in and filter persistent gas vapors, as action of chloride of lime is not immediate.

(12) When undercarriages of vehicles are not muddy, the hand method is usually used regardless of the number of vehicles to be decontaminated.

(13) When undercarriages are heavily encrusted in mud and more than four vehicles are to be decontaminated, a wallow course is laid out where undercarriages of vehicles are decontaminated. The wallow course should be laid out on a very muddy spot, preferably a low place covered by 6 to 8 inches of water. A small stream can be dammed up or the edge of a swamp or pond can be used. A circular course to accommodate the vehicle with the largest turning radius is laid out. Then 200 pounds of lime are evenly spread on the tracks. The vehicles are run around the course five times in each direction. They should be run as fast as practicable on the small circle and should be zigzagged to increase the scouring action of the lime-mud slurry.

FIGURE 37.—If vehicles have been in chemical attack, do no maintenance work until they have been carefully checked and decontamination has been completed. Serious burns may result.

FIGURE 38.—Prior to going into bivouac or on long halts, vehicles which have been under chemical attack are checked. Those found contaminated are reported for second echelon decontamination.

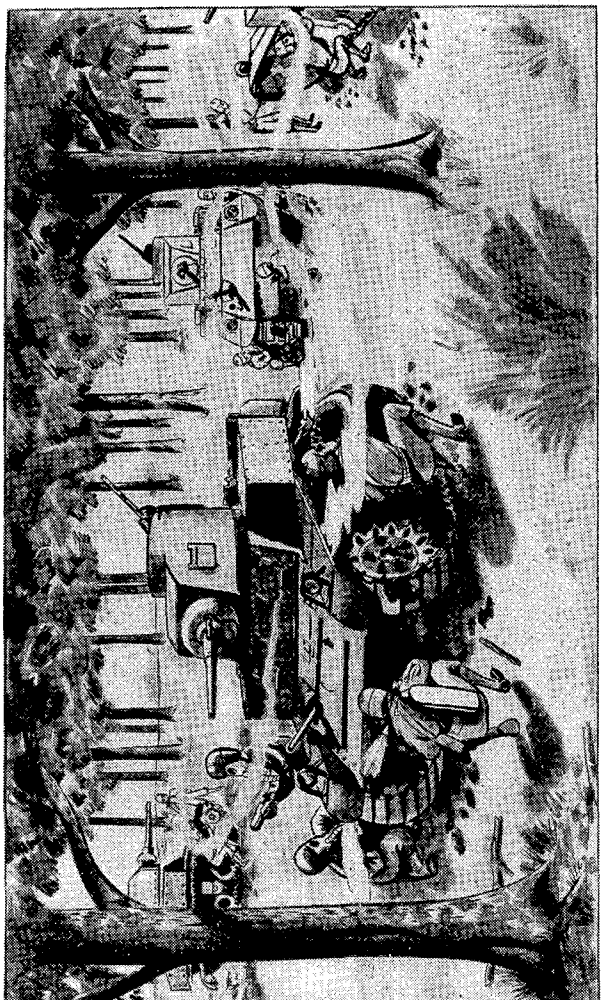

FIGURE 39.—Do not decontaminate in bivouac area. Chemicals in the mud from undercarriages will give off vapors which will force personnel into gas masks, and men may be burned during the night by coming into contact with contaminated mud.

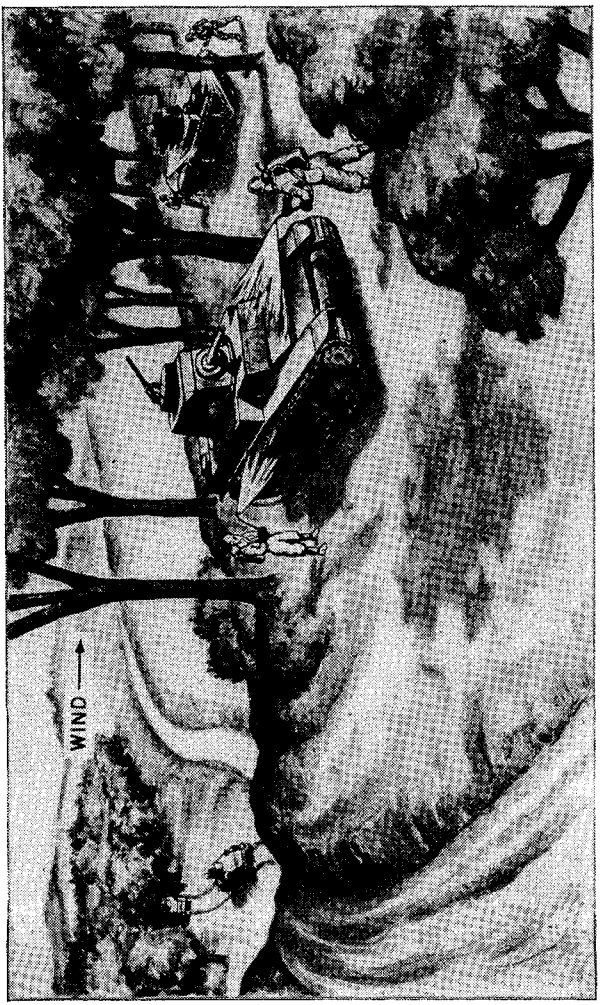

FIGURE 40.—Select decontaminating point down wind from bivouac area, and move vehicles into bivouacs after they are decontaminated.

FIGURE 41.—Do not clean by hand the undercarriages of a large number of vehicles which are heavily encrusted with mud. Removal of the mud will take altogether too long.

FIGURE 42.—Lay out wallow course of lime-mud slurry and run vehicles around it. It will do a satisfactory job and will save time and labor.

c. Alternate methods.—(1) (*a*) In case DANC is not available, chloride of lime slurry can be swabbed on the exterior of the body and on the bottom and sidewalls of the engine compartment. In using it in the interior of vehicles, it is preferable to dampen rags with the slurry and wipe down the interior walls to reduce risk of getting the slurry on equipment it will destroy or injure. Take care that it does not come in contact with fabric equipment or bright metal surfaces on weapons or instruments. Weapons and instruments are then decontaminated by wiping them off with rags dampened by fuel oil. This may have to be repeated several times to produce satisfactory results.

(*b*) Undercarriages are decontaminated as already prescribed.

(2) (*a*) In case neither chloride of lime nor DANC is available the bodies of vehicles can be decontaminated by repeated application of fuel oils as in first echelon decontamination.

(*b*) When undercarriages are not encrusted with mud, the same method can be applied. However, they should not be burned off due to the fire hazard. Flames may get out of control by igniting oil and grease that may be on the undercarriage. When undercarriages are heavily encrusted with mud, they can be decontaminated by running 5 miles over muddy terrain. This should not be done on a small course for mud alone does not neutralize the agent but only removes it mechanically by scouring action. On a small course the mud will become so contaminated that the only effect after the first few tanks have run over the course will be to replace contaminated mud with more contaminated mud.

■ 14. THIRD ECHELON.—*a. Equipment.*

One decontaminator, 400 gallons, power-driven, filled with lime slurry.
Six decons–3 filled with DANC.
Rags and waste.
Crayons, detector.
Pioneer tools and brushes from vehicles.
Kit, HS vapor detector. (Carried by unit gas officers and certain gas noncommissioned officers.)

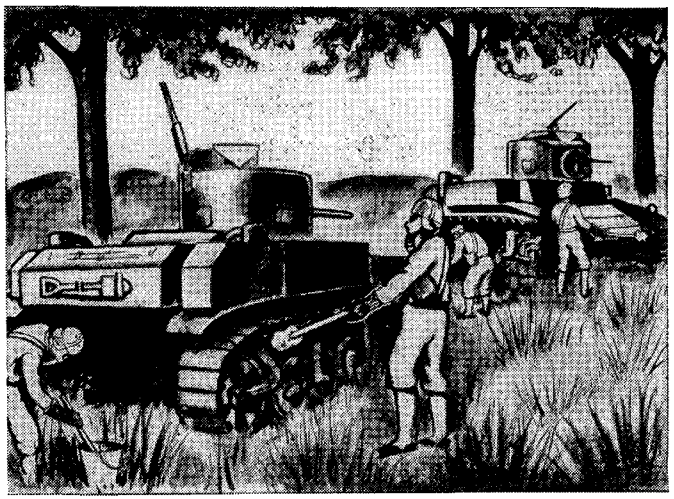

FIGURE 43.—When DANC is not available, chloride of lime slurry can be swabbed on the exterior of the vehicle.

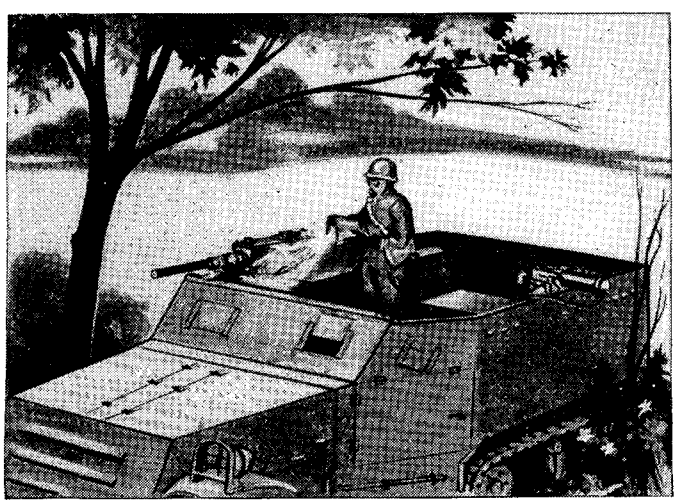

FIGURE 44.—Do not pour lime slurry on interior of vehicles, weapons, instruments or fabric equipment. It will corrode or destroy them.

Cleaner, high pressure, chemical and steam. (Available in certain maintenance units when carried in field.)

b. Procedure.—(1) Third echelon decontamination is carried out on contaminated vehicles which have been brought directly to maintenance parks for repair and also in cases where emergency field repairs on contaminated vehicles are necessary.

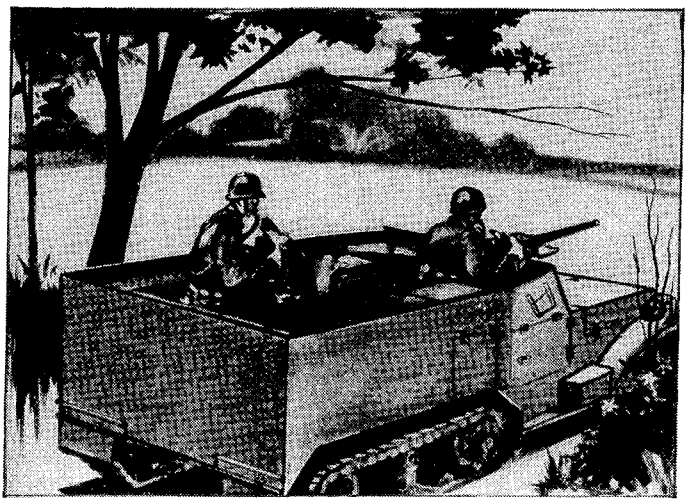

FIGURE 45.—When DANC is not available, wipe off interior with cloth or waste dampened in lime slurry. Weapons are decontaminated with fuel oil.

(2) A decontamination point is set up down wind of other installations in each maintenance park. It is located near water when available.

(3) The company gas noncommisioned officer under the supervision of the company commander is in direct charge of decontamination. The driver and assistant of the decon–PD and, if present, crew members of the disabled vehicles, do the work, using the decons–3.

(4) Disabled vehicles arriving for repair stop at the decontamination point and are checked for the presence of chemical agent if there is any likelihood that they are contaminated.

FIGURE 46.—When exteriors of bodies of vehicles are decontaminated by burning off, form vehicles in column cross wind; otherwise, gas that is vaporized will burn men down wind.

(5) In third echelon decontamination, the mud and dust are removed from outside of vehicle first, after which the interior, body, and undercarriage are decontaminated. The reason for this is that the force of the stream of water from the decon–PD (600 pounds per square inch) when used on the outside of the vehicle may drive some of the persistent chemical into the interior.

(6) Tanks or other completely closed vehicles to be cleaned with the power-driven decontaminator, using water and the jet nozzles, are washed, starting at the top of the turret and working down. The sides and undercarriages of scout cars, half-track personnel carriers, and self-propelled gun mounts are washed down starting from just below the machine-gun rail with the nozzles pointed down at a sharp angle so that water will not carry contaminated mud into the interior of the body. Trucks, ¼-ton, may be washed down all over. Operators should wear impervious clothing with gas masks adjusted while doing this work. If impervious suits are not available, the cellophane covers will be the next satisfactory.

(7) When steam cleaners are available they may be used to remove grease from engine compartments.

(8) If lime slurry is to be used as the decontaminant, the valve of the power-driven decontaminator is then turned to pump from the tank and lime slurry is sprayed on the outside of the body and undercarriage using the spray nozzle. The decision as to using DANC or lime slurry is based on how soon maintenance work is to be done on the outside or undercarriage. If repairs are to be started in less than 3 hours, DANC should be used; otherwise, lime slurry should be used due to its greater availability.

(9) The vehicle is then moved forward to uncontaminated ground where the crew members are furnished with the decon–3 to decontaminate the interior of body, engine compartment, and weapons, if lime slurry has been previously used on the outside; otherwise, the entire vehicle is decontaminated with DANC. Weapons and bright metal surfaces are next wiped off with rags dampened with fuel oil and are then reoiled. Care must be taken that DANC does not get into the interior of the motor.

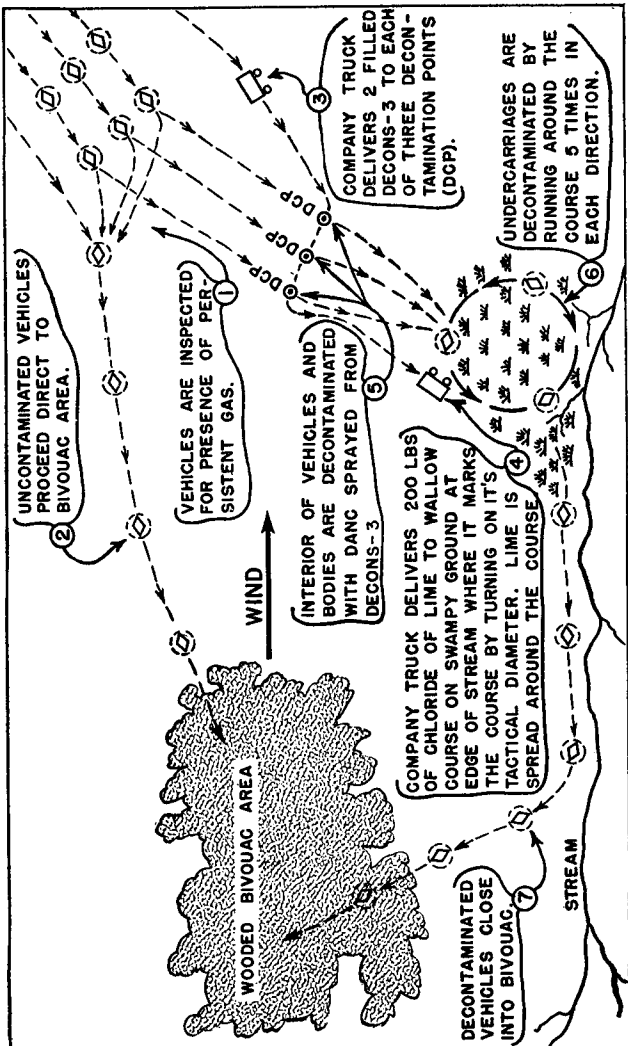

FIGURE 47.—Lay-out of a satisfactory company contamination area—schematic.

(10) The vehicle is thoroughly checked with crayon detector, and any additional decontamination work indicated is done before it is moved to the mobile repair shops in the maintenance area.

(11) When damaged contaminated vehicles are brought in on rescue vehicles, the rescue vehicles must be checked and decontaminated as indicated.

(12) Maintenance crews sent forward to make emergency repairs carry one or two decons–3 filled with DANC to decontaminate the parts of the disabled vehicle that must be handled. If the terrain is muddy and there are several vehicles in the same locality that are known to be contaminated, and if the decon–PD can be spared at the decontaminating point, it should be taken forward filled with water to save time in cleaning mud from the undercarriages of the disabled vehicles.

c. Alternate methods.—(1) When neither DANC nor chloride of lime is available, a solution made by adding 5 pounds of washing soda to each 100 gallons of water can be used effectively in the decon–PD to remove much of the contamination.

(2) When neither DANC nor lime is available, a mud slurry may be used in the power-driven decontaminator in place of lime slurry. It should be used with the jet nozzle in place of the spray nozzle, however, as its principal advantage over water is the added scouring action of the particles of grit in the mud. The mud slurry should be carefully screened when it is prepared. A clay soil should be used as any small stones or any considerable amount of sand will injure the pump on the decontaminator. It should be used only in an emergency when speed is essential. The interior of the vehicle and weapons are decontaminated with fuel oil, after use of the mud slurry as in first echelon decontamination.

(3) When steam cleaners are available they may be used to decontaminate the exterior of vehicles when DANC or chloride of lime slurry cannot be obtained. This method is slow but is faster than swabbing off or burning off the exterior of vehicles with fuel oil.

■ 15. MASS.—*a. Equipment.*—All equipment noted in first, second, and third echelon decontamination is needed.

FIGURE 48.—If persistent chemicals have been used, do not start maintenance work on vehicles without first checking them for the presence of gas. Mechanics will be burned if parts handled are contaminated.

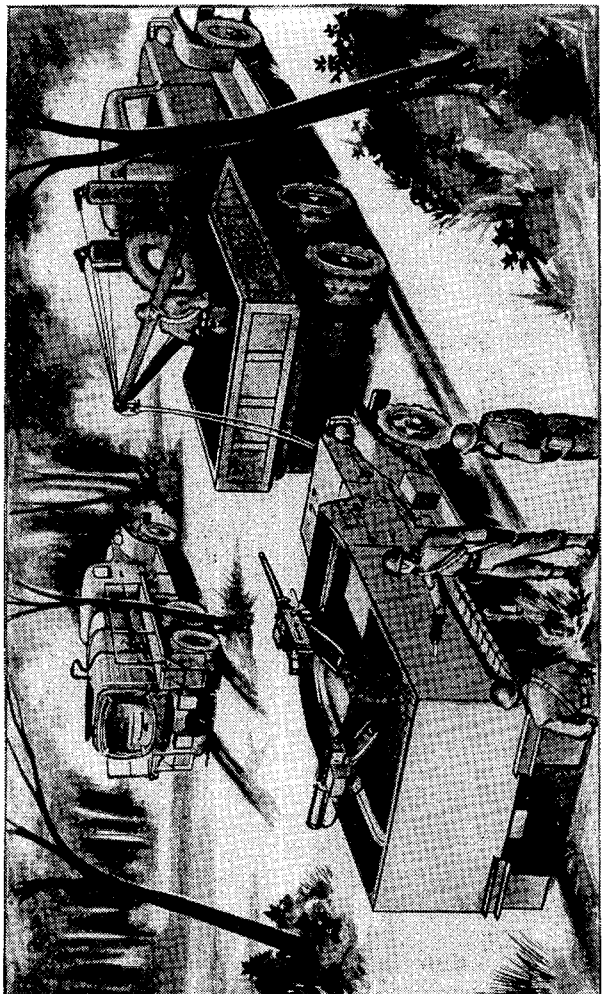

FIGURE 49.—When enemy is known to have used persistent chemicals, check all disabled vehicles brought to maintenance park via decontaminating point.

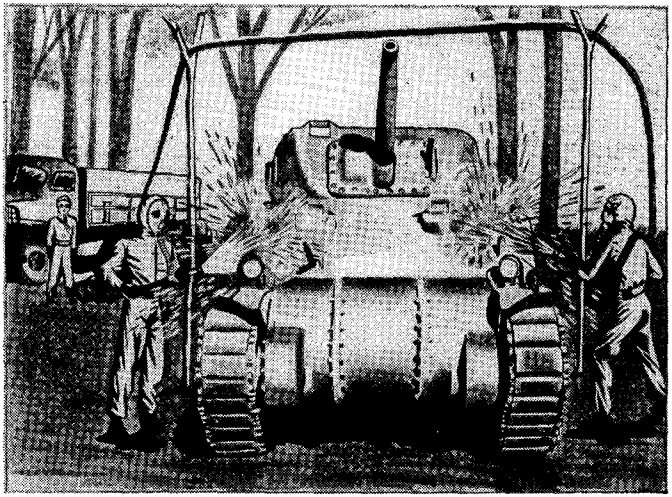

FIGURE 50.—Operators of power-driven decontaminator should be equipped with impervious suits.

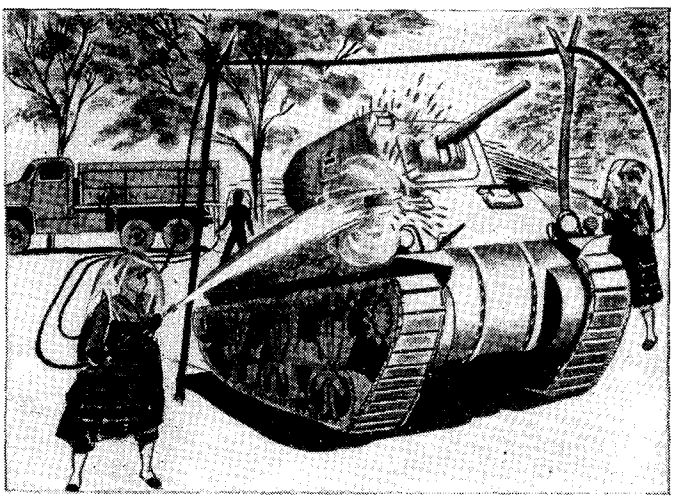

FIGURE 51.—If impervious suits are not available, the cellophane cover is next satisfactory.

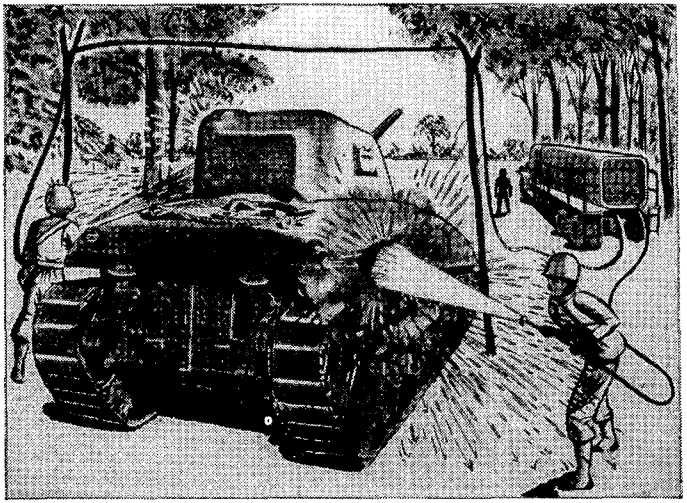

FIGURE 52.—Do not allow power-driven decontaminator operators to work in field uniforms. They will be splashed with contaminated water and mud and burned.

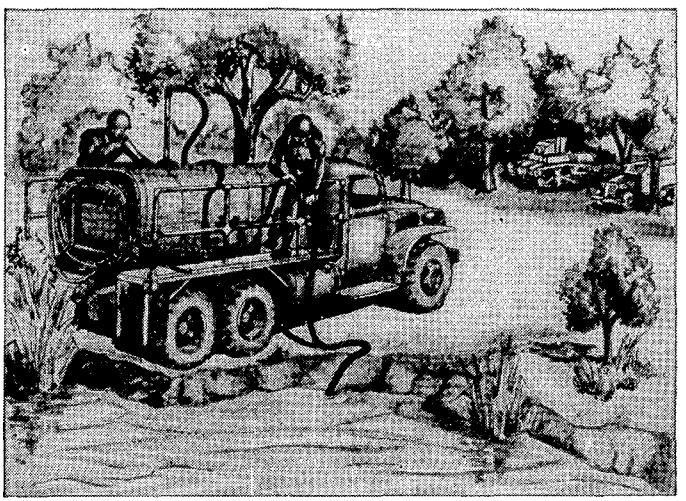

FIGURE 53.—Place decontamination point by water when possible. Water can then be pumped from source and used directly in washing down vehicles. Container can be filled with decontaminant and used by turning a valve.

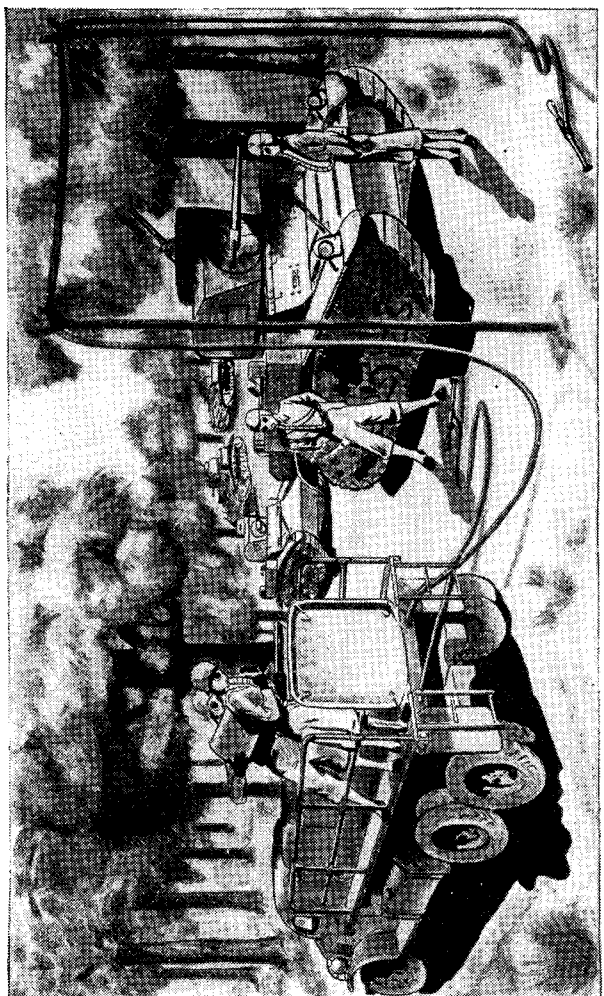

FIGURE 54.—When decontamination point is not located by water, the power-driven decontaminator cannot be used as a washer unless the container is previously loaded with water. It can be used as a washer until water is exhausted, but valuable time is lost while container is being filled with decontaminant.

b. Procedure.—(1) The enemy may use persistent chemicals in large quantities either by air attack or by persistent chemical mines which will be exploded when vehicles cross a barrier. It is possible to have the major part of a unit the size of a division contaminated at one time. If the tactical situation permits, it will be highly desirable to decontaminate the entire unit before proceeding.

(2) Mass decontamination is a problem of organization of a major portion or all of a large unit for decontamination.

(*a*) Instructions are given that subordinate units will move out of the contaminated area.

(*b*) All echelons of decontamination are employed as heretofore prescribed.

(*c*) Decontamination areas are usually prescribed for subordinate units.

(*d*) Power-driven decontaminators are moved forward for use by units most heavily contaminated.

(*e*) When necessary, redistribution of decontamination equipment is coordinated by higher unit commanders.

(*f*) Steps are taken to refill with decontaminants at the earliest opportunity.

(*g*) Units are ordered to move from decontamination areas as soon as decontamination is completed.

APPENDIX I

QUESTIONS AND ANSWERS

1. *Q.* What two advantages do units of the Armored Force have in meeting a persistent chemical attack?
   A. (1) Protection offered by the vehicle.
   (2) Ability of armored units to carry antichemical equipment in vehicles immediately available to the personnel.
2. *Q.* What are the characteristics of persistent chemicals?
   A. They are heavy, oily liquids which will adhere to vehicle surfaces for varying lengths of time and may be absorbed by grease on the vehicle. If they come in contact with the skin they cause burns which are very slow in healing. These liquids give off vapors which will burn the eyes and lungs if the gas mask is not worn.
3. *Q.* What surfaces readily absorb these chemicals, and what surfaces only moderately?
   A. Oil-painted surfaces and grease readily absorb liquid persistent chemicals. Lacquered surfaces only moderately absorb them. Rubber absorbs them slowly.
4. *Q.* In what four ways may the effect of these chemicals be neutralized?
   A. (1) By decontaminating chemicals.
   (2) By heat, that is, by burning off the surface.
   (3) By dissolving in fuel oil and wiping off surface.
   (4) By scouring bright or lacquered metal surfaces with mud.
5. *Q.* In what four ways will contamination of armored vehicles occur?
   A. (1) From passing over contaminated terrain covered by underbrush, high grass, mud, or dust.
   (2) From airplane spray.
   (3) From the splash of a direct hit or near miss by gas shells, gas bombs, or explosion of gas-filled land mines.
   (4) From standing in an atmosphere with a heavy concentration of chemical in vapor form.

6. *Q.* What protective equipment must be carried by personnel in order to be in a constant state of readiness to perform first echelon decontamination?
   A. (1) Gas mask.
   (2) Impregnated clothing including cotton gloves.
   (3) Cellophane covers.
7. *Q.* When will impregnated clothing be provided for Armored Force soldiers?
   A. When the unit is alerted at its home station for movement to a theater of operations, in the staging area, or as soon as the unit arrives in the theater of operations.
8. *Q.* Can troops impregnate their own clothing?
   A. Yes, by field methods as outlined in Training Circular No. 4, W. D., January 21, 1942.
9. *Q.* Can impregnated clothing be worn continually in the field?
   A. Yes, it is almost as comfortable as untreated clothing.
10. *Q.* Normally, how many times can impregnated clothing be laundered before it will be necessary to reimpregnate it?
   A. Three to five times.
11. *Q.* What is used in treating leather shoes and leather equipment to make it resistant to gas?
   A. Shoe impregnite. Full instructions for applying appear on the container.
12. *Q.* Will top covers, seat covers, etc., be impregnated?
   A. Fabric equipment of this kind which is not made of gas-impervious material will be impregnated by the same method used for clothing or, in the case of larger items or items which cannot be removed from vehicles, by applying the impregnite solution with a brush or broom.
13. *Q.* Can impregnated top covers of open vehicles be used under field conditions in protection against chemical attack?
   A. Yes. In the theater of operations impregnated top covers of open vehicles will be unrolled and spread inside the vehicle to cover extra ammunition, rations, personal equipment, etc.

14. *Q.* Why is it necessary to treat ordinary fabric and leather to make such material gasproof?
    A. The time required to decontaminate untreated material is too great during active operations.
15. *Q.* What is meant by first echelon decontamination?
    A. This refers to the decontamination performed by the crew of the vehicle with the equipment normally carried in the vehicle.
16. *Q.* Who orders and supervises this work?
    A. The vehicle commander.
17. *Q.* In first echelon decontamination do we try to decontaminate the entire vehicle?
    A. No. Limited time and limited decontaminating materials carried in the vehicle make it impossible. We decontaminate only the weapons, equipment, and parts of the vehicle necessary to enable us to continue in action with reasonable safety from effects of chemicals.
18. *Q.* What is the final operation in first echelon decontamination?
    A. Wiping off all weapons, instruments, and machined surfaces which have been treated with DANC, using oily waste, and then wiping off vision slits and periscopes with a dry cloth.
19. *Q.* Approximately how long should it take to perform first echelon decontamination?
    A. A trained crew can perform first echelon decontamination in 3 minutes or less.
20. *Q.* Who performs second echelon decontamination?
    A. Second echelon decontamination is performed by the crew of the vehicle and specially trained men in company headquarters with the equipment carried by the company.
21. *Q.* Who orders and supervises second echelon decontamination?
    A. The company commander.
22. *Q.* To what extent can a vehicle be made safe in second echelon decontamination?
    A. The vehicle can be made safe for the crew or for maintenance personnel to work on it without individual protective equipment, provided 3 hours'

reaction time is allowed when chloride of lime has been used.

23. *Q.* What decontamination equipment and material is carried by the company for second echelon decontamination?

A. Three or six decons–3, appropriate fillings of DANC, and 200 pounds of chloride of lime are carried by the company. This is sufficient to decontaminate thoroughly about one-half the vehicles in the company, or if the contamination is light, is sufficient to decontaminate all vehicles.

24. *Q.* Who performs third echelon decontamination? How and where?

A. The driver and assistant of the decon–PD and the crews of the disabled vehicles decontaminate at decontamination points in maintenance areas or parks, using the decon–PD and hand-operated equipment.

25. *Q.* Who orders and supervises this work?

A. The maintenance unit commander.

26. *Q.* What may have to be done when units meet large scale airplane spray attacks?

A. Additional materials may have to be distributed and the entire unit organized for mass decontamination. Methods employed are the same as in first, second, and third echelon decontamination.

27. *Q.* Who orders and supervises such decontamination?

A. Regimental or higher commanders.

28. *Q.* What filling is used in the decon–1½?

A. Agent, decontaminating, noncorrosive (DANC).

29. *Q.* Does DANC in a filled apparatus remain effective indefinitely?

A. No. If the apparatus is not used in 6 months it must be emptied and refilled with fresh DANC.

30. *Q.* What important maintenance should be performed frequently on the 1½-quart apparatus?

A. The discharge opening should be cleaned of any deposit or dirt, using a piece of wire or a knife blade.

31. *Q.* What decontaminating agent may be used in the decon–3?

A. DANC.

32. *Q.* How is this apparatus operated and how is it cleaned?
    A. It is operated by pumping the handle 20 to 25 strokes to build up pressure before opening shut-off valve. It is cleaned by unscrewing and cleaning nozzle by hand.
33. *Q.* In what organizations are the apparatus, decontaminating, power-driven (decon–PD) found?
    A. Maintenance companies.
34. *Q.* How is the decon–PD used?
    A. It is used to clean the undercarriages of vehicles with water and to decontaminate them with lime slurry.
35. *Q.* What is the tank capacity of the decon–PD, and what pressure can it develop?
    A. The tank capacity is 400 gallons. With a jet nozzle it can throw water at a pressure of 600 pounds per square inch, making it very effective for removing mud from vehicles.
36. *Q.* What should be done with swabs, rags, and cleaning brushes used in decontamination?
    A. Throw swabs and rags away when the work is completed, for they will be badly contaminated. Brushes should be decontaminated with DANC.
37. *Q.* What is the color change of paint, detector, when in contact with drops of liquid persistent chemical?
    A. The paint which is normally olive drab in color turns red when affected by drops of liquid chemical.
38. *Q.* Does a coat of paint, detector, last indefinitely?
    A. No; it should be removed every 14 days and the panel repainted with a new coat of the paint, detector.
39. *Q.* What is the color change of the crayon detector when marks are made on contaminated surfaces?
    A. The crayon detector which normally resembles red chalk changes to blue when a persistent agent is present.
40. *Q.* What is the purpose of the kit, HS vapor detector?
    A. To detect the presence of mustard in vapor form.
41. *Q.* What personnel carries the kit, HS vapor detector, and how is it generally used?
    A. All unit gas officers and certain gas noncommissioned officers of the Armored Force carry the kit, HS vapor detector. It is used to test air inside vehicles, to

check on the thoroughness of decontamination, and to test air in wooded areas before occupation by troops for bivouacs or maintenance parks.

42. *Q.* Does DANC affect rubber and plastics?
    A. It will decompose rubber and plastics if left in contact for any length of time.
43. *Q.* Are the fumes of DANC dangerous?
    A. Yes. They are toxic and gas masks must be worn in vehicles until the strong odor of DANC fumes has disappeared.
44. *Q.* What chemicals will DANC neutralize?
    A. All persistent chemicals.
45. *Q.* How is DANC shipped for storage and in what quantities?
    A. In a compartmented container which keeps the active agent in dry powder form separate from the liquid solvent. The amounts in each container are in the proper proportions for a solution of 5 gallons of DANC.
46. *Q.* Is it safe to use chloride of lime on fabrics, leather, or bright metal surfaces?
    A. No. It destroys fabric and leather items and corrodes bright metal surfaces.
47. *Q.* Should dry chloride of lime be sprinkled on liquid persistent chemicals?
    A. Definitely not; a violent reaction will produce a flash of flame and intense heat, driving off heavy concentrations of vapor.
48. *Q.* How should chloride of lime slurry be prepared?
    A. Mix four parts of chloride of lime with three parts of water, by volume. First make a paste with the lime and a little of the water, and then stir in the remainder of the water.
49. *Q.* What "rule of thumb" can be followed in preparing a mud-lime slurry course?
    A. Pour over the mud 4 pounds of chloride of lime per lineal yard of the course.
50. *Q.* Compare the decontamination reaction time of DANC and chloride of lime slurry.
    A. DANC neutralizes liquid persistent chemical almost immediately upon contact. Chloride of lime de-

stroys persistent chemical effectively but rather slowly.

51. *Q.* Why is water not as effective as DANC or chloride of lime slurry for neutralizing Lewisite?
    A. Water destroys Lewisite to the extent of eliminating its toxic vapors, but it leaves a toxic coating in powder form on the contaminated surface which will produce burns.
52. *Q.* How are gasoline and Diesel fuel used as alternate agents in decontamination?
    A. Both these fuels may be used to dissolve liquid persistent chemicals. Gasoline may also be used to burn these vesicant chemicals off metal surfaces.
53. *Q.* Why is a supply of rags or waste necessary?
    A. Rags or waste are used in wiping off weapons with the decontaminant. When soaked in gasoline, rags serve as torches for burning off contaminated exterior metal surfaces.
54. *Q.* In burning off a vehicle, how large an area can be burned off at one time?
    A. Burn off only a small panel at a time, using a small amount of gasoline.
55. *Q.* When it is perceived that open vehicles are to be subjected to airplane chemical attack what is the first action taken by the crews?
    A. Crew members adjust cellophane covers.
56. *Q.* In above situation, when do crews of open vehicles adjust gas masks?
    A. As soon as cellophane covers are adjusted if time is available; otherwise, they mask as soon as firing at airplane has ceased.
57. *Q.* Should cellophane covers be decontaminated and kept after they are contaminated from airplane chemical attack?
    A. No. They should be thrown over the side of the vehicle after all the chemical has fallen, for they are likely to be badly contaminated.
58. *Q.* What steps are immediately taken by a tank crew when a chemical attack is imminent?
    A. If tank is open, close it.

59. *Q.* A tank is moving along buttoned up and becomes contaminated with persistent chemical. What is the first thing the crew should do?

A. Adjust gas masks.

60. *Q.* When a vehicle encounters a chemical attack should it be halted immediately and decontamination be started?

A. No. Continue to move out of the contaminated area, decontaminating the interior of the vehicle as you go. When out of the contaminated area and the tactical situation permits, decontaminate the forepart of the vehicle.

61. *Q.* What steps are immediately taken by a tank crew when the tank becomes contaminated?

A. (1) Adjust gas masks.
(2) Crew members inspect each other for drops of liquid chemical.
(3) Liquid chemical is removed with rag or waste, protective ointment is applied to the affected spots, and any other first-aid measures indicated are taken at once.

62. *Q.* What surfaces inside a tank are most likely to be contaminated with liquid chemical?

A. (1) Surfaces around door in front of driver.
(2) Surfaces at bottom of the turret ring.

63. *Q.* What care must be taken of machined metal surfaces after decontamination with DANC?

A. All weapons, instruments, and machined surfaces are reoiled by wiping with oily waste or rags.

APPENDIX II

TABLE OF ADDITIONAL DECONTAMINANTS

■ 1. PERSISTENT LETHAL CHEMICALS.

Common name and symbol of chemicals	Mustard, HS	Lewisite, M1	ED	HN-2
Additional compounds which may be used for decontaminants if available.	3 percent sodium sulphide (Na_2S) in water; steam; gaseous chlorine. Bury under moist earth. Oxidizing agents: nitric acid, hydrogen peroxide, chromic acid. Water glass (for sealing porous surfaces).	Same as for HS; also alcoholic or aqueous sodium hydroxide (lye) spray. Hydrolysis by use of water and/or steam may be used, as well as oxidizing agents, though due to production of toxic oxide it is best to use alkalis (lye, washing soda, baking soda, etc.) as these completely destroy.	Sodium hydroxide (lye) solution. Hydrogen peroxide; sodium iodide in acetone solution; hydrogen sulphide in aqueous solution or alcoholic solution.	Any quick acting oxidizing agent, as chromic acid or hydrogen peroxide.
Decontamination of clothing.	Chlorine and steam (woolens); sodium sulphide (1 percent aqueous solution, heated); green solution (baking soda, 1 lb./gal. dissolved in sodium hypochlorite solution), sodium carbonate (washing soda) ¼ lb./1 gal. water.	Same as for HS except that chlorine and steam should not be used due to formation of toxic oxide.	Same as for M1.	Aeration, and/or washing by the standard laundry process.

■ 2. OTHER CHEMICALS WHICH MAY BE USED FOR HARASSING.

Common name and symbol of chemicals	Adamsite DM	DA	CN	CNS	CA
Additional compounds which may be used for decontaminants if available.	Gaseous chlorine; bleach liquors.	Caustic soda (lye) gaseous chlorine.	Strong, hot solution of sodium carbonate (washing soda). 60 percent sulfuric acid; oxidizing agents in benzene solution; hot alcoholic solution of sodium thiosulphate (photographers' hypo) in water; alcoholic ammonia. Hot acetic acid solution of potassium iodide.	Hot solution of sodium carbonate and sodium sulfite.	Alcoholic sodium hydroxide (lye) spray; alcoholic solution of sodium sulphide. Boiling with aqueous-alcoholic solution of sodium thiosulphate (photographers' hypo). Alcoholic-water solution of ammonium thiocyanate.
Decontamination of clothing.	None necessary.	None necessary.	Hanging in open air is usually sufficient, especially if air is moving appreciably.	Same as for CN.	Seldom necessary.

NOTES

1. DANC and chloride of lime are the standard decontaminants issued to Armored Force units.

2. Fuel oils may be used in an emergency when the standard decontaminants are not available as outlined under alternate methods.

3. In addition to the standard decontaminants there are many compounds which are effective for that purpose. The most common ones are tabulated in case they might be available for local procurement or seizure in an oversea theater in which there might be a temporary shortage in standard decontaminants for issue.

4. Chemical officers and unit gas officers must be resourceful under all circumstances. For example, in desert regions the surrounding earth and sand are often strongly alkaline in reaction. In such cases a paste of such earth or water that has been run through the sand may yield a good decontaminant for those agents that can be destroyed by alkalis. In coal mining regions acid mine water is frequently available which might be used where an acid is called for in decontamination. In industrial operations waste liquors from paper mills, beet sugar factories, and pickling liquors from steel mills can often be obtained that are acid or alkaline, as well as liquors bearing relatively high percentages of free chlorine, hydrogen sulphide, etc. None of these sources should be overlooked when emergency decontamination is necessary.

5. *Before using acid or lye consult chemical officer.*

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